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ABSTRACT

Two hundred individuals attended the 3-day conference planned to provide an opportunity for members of various disciplines to review some of the forces that are changing manpower requirements and to explore ways of staffing medical laboratories that will serve America's health needs more effectively. Presentations included in the document are: (1) "Recruitment--A Part of the Life-Long Education of the Medical Laboratory Professional" by Kevin P. Bunnell, (2) "The Social and Economic Outlook" by Eli Ginzberg, (3) "The Medical Laboratory: A Look into the Future" by Ivan L. Bennett, (4) "Changing Patterns in Education by George A. Wolf, and (5) "Health Legislation as It Affects Medical Laboratory Manpower" by Paul G. Rogers. Discussion group reports are also included. Sixteen conference recommendations relate to such matters as: (1) a study of skill and manpower requirements, and realignment of laboratory career categories and related educational levels in keeping with the findings of the study, (2) a formulation of a uniform laboratory workload reporting system to assist in projecting manpower needs, (3) recruitment efforts, (4) upgrading of elementary and high school science education, and (5) development and strengthening of vocational school, junior college, college, and university educational programs. (JK)

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manpower for the medical laboratory

THE NATIONAL CONFERENCE ON EDUCATION AND CAREER DEVELOPMENT OF THE NATIONAL COMMITTEE FOR CAREERS IN MEDICAL TECHNOLOGY

October 11–13, 1967

THE PROCEEDINGS

Sponsored by
National Committee for Careers in Medical Technology
and the
U.S. Department of Health, Education, and Welfare,
Public Health Service, National Center for Chronic Disease Control,
Cancer Control Program
With the cooperation of
National Council on Medical Technology Education
Bureau of Health Manpower, Public Health Service
National Communicable Disease Center, Public Health Service
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January 2, 1968

In the evolution of medical laboratory practice, social, economic, scientific and technological forces are demanding the serious attention of all concerned. Medicare, Medicaid, group health practices, Regional Medical Programs, centralization of laboratories, automation and electronics in laboratory processes and an enormously increasing demand for tests and services are creating such forces today.

The responses of laboratory medicine to these forces will affect profoundly the recruitment, education and careers of laboratory personnel. To assure improvement in quality of laboratory service and patient care, as the new staffing patterns develop, all groups engaged in laboratory medicine must seek wisdom in planning and coordination in action.

This need has been impressed upon the National Committee for Careers in Medical Technology in its efforts to recruit personnel and its studies of manpower and training problems. The Cancer Control Program of the Public Health Service arrived at a similar conclusion through its support of cytotechnology training and of experiments in graduate and continuing education for medical technologists.

As a result, the National Committee contracted with the Cancer Control Program to conduct this interdisciplinary conference on Manpower for the Medical Laboratory. The conference was held October 11 through 13, 1967, at the Center for Adult Education, University of Maryland. Two hundred of the Nation's leading pathologists and medical technologists, clinical chemists and microbiologists, public health and manpower specialists, occupational analysts, hospital administrators, educators and testers, scientists and economists were there.

As a next step, the Conference Planning Committee urges immediate establishment of an interdisciplinary task force to implement the conference recommendations and proposals.

Robert W Coon MD

THE CONFERENCE FORMULA

This interdisciplinary conference on "Manpower for the Medical Laboratory" was concerned with personnel below the level of laboratory director. The positions under consideration included the three principal categories of certified personnel -- medical technologists, cytotechnologists, and laboratory assistants -- as well as other professional and associated staff members such as chemists, biologists, technicians and aides.

The program included (1) keynote addresses and a symposium to provide information about the conference background, objectives, and discussion questions and (2) eight discussion groups concurrently-held to study and seek suggestions and solutions for problems related to Manpower for the Medical Laboratory.

Participants were assigned to groups related to their interests, with several disciplines represented in every discussion group. Each participant was provided a background paper containing pertinent information and outlining key questions and issues related to the discussion topic of his group.

In addition to the background papers, conference participants received Resource Books containing reports, tables, charts, pamphlets, article reprints and special studies on laboratory personnel. The contents covered: Supply and Demand of Personnel, Federal Legislation, Education of Laboratory Personnel, Licensure and Certification, Health Manpower Studies. Some of the materials specially prepared for the Resource Book are included in the Appendix to the Conference Proceedings.

Each discussion group had a moderator, an assistant moderator, and resource persons expert in the discussion topic. Experienced reporters were assigned to report objectively each group's deliberations and recommendations.

CONFERENCE OBJECTIVES

The overall objective of the conference was to provide opportunity for members of the various disciplines concerned with training and utilization of medical laboratory personnel to (1) review some of the forces that are changing manpower requirements and (2) explore ways of staffing medical laboratories that will serve America's health needs more effectively.

This broad directive was expressed as:

* Identifying laboratory personnel requirements as affected by changing demands of health care and distribution of services
* Analyzing the effects of technology and automation on present and future laboratory personnel needs
* Examining ways to attract, educate, train and retrain qualified laboratory personnel
* Exploring career mobility and equivalency
* Studying certification and licensure of personnel and accreditation of schools

THE PROGRAM OF THE CONFERENCE

Wednesday, October 11

Presiding, Robert W. Coon, M.D., Chairman National Committee for Careers in Medical Technology

"Introductory Remarks," Donald R. Chadwick, M.D., Assistant Surgeon General, Director National Center for Chronic Disease Control, U.S. Public Health Service

"Recruitment -- A Part of the Life-Long Education of the Medical Laboratory Professional," Kevin Bunnell, Ed.D., Associate Director, Western Interstate Commission on Higher Education

Thursday, October 12

Morning -

Introductions by Rex D. Couch, M.D., Conference Project Director

"Statement of Conference Objectives," Leonard D. Fenninger, M.D., Director Bureau of Health Manpower, U.S. Public Health Service

"The Social and Economic Outlook," Eli Ginzberg, Ph.D., Director, Conservation of Human Resources, Columbia University

"The Medical Laboratory: A Look Into the Future," Ivan L. Bennett, Jr., M.D., Executive Office of The President

"Changing Patterns of Education," George A. Wolf, M.D., Provost and Dean, School of Medicine, University of Kansas

Symposium on Major Medical Laboratory Manpower Issues
Moderator, Calvin Plimpton, M.D., President of Amherst College
(See next page for panelists.)

Afternoon -

Discussion Groups on Major Medical Laboratory Manpower Issues
(See next page for topics, moderators, assistant moderators, resource persons)

Evening -

Presiding, Ruth F. Hovde, MT(ASCP)MS, Conference Planning Committee

"Health Legislation as it Affects Medical Laboratory Manpower," The Honorable Paul G. Rogers, Congressman from Florida

Friday, October 13

Discussion Group Meetings

Discussion Group Reports by Moderators

INTERDISCIPLINARY SYMPOSIUM ON MAJOR MEDICAL LABORATORY MANPOWER ISSUES

Education, Calvin Plimpton, M.D., President of Amherst College, Amherst, Massachusetts

Clinical Pathology, E.R. Jennings, M.D., Memorial Hospital of Long Beach, California

Medical Technology, Leanor Haley, MT(ASCP)Ph.D., Director Microbiology Department, State University Hospital, Brooklyn, New York

Clinical Chemistry, Ralph E. Thiers, Ph.D., Director of Clinical Chemistry and Associate Professor of B9ochemistry, Duke University Medical Center, Durham, North Carolina

Hospital Administration, Montague Brown, Director of the Hospital Research Educational Trust of New Jersey, Princeton, New Jersey

Health Planners, Stanley Olson, M.D., Director of Tennessee Mid-South Regional Medical Program, Nashville, Tennessee

Physician Users of Laboratory Services, Bland Cannon, M.D., Member of AMA's Council on Medical Education and its Committee on Allied Health Professions and Services, Memphis, Tennessee

Community Users of Laboratory Services, George James, M.D., Dean, Mount Sinai School of Medicine, Mount Sinai Hospital, New York City

DISCUSSION GROUPS ON MAJOR MEDICAL LABORATORY MANPOWER ISSUES

I. "Needs and Potential Sources for Laboratory Personnel"

Moderator: Marjorie Williams, M.D., Director, Department of Pathology and Allied Sciences, Veterans Administration, Washington, D.C. Assistant Moderators: Stanley S. Katz, M.A., Professor and Chairman, Medical Technology, Quinnipiac College, Connecticut; E.L. Miller, Ph.D., Chairman, Premedical Advisory Committee, Stephen F. Austin College, Texas. Resource Persons: Walter Studdiford, Bureau of Employment Security, Department of Labor; Harry P. Smith, M.D., Librarian-Archivist, American Society of Clinical Pathologists; Loula Woodcock, MT(ASCP), Chief Medical Technologist, Scripps Memorial Hospital, La Jolla, California

II. "Impact of Automation and Other Advances in Technology and Science on Medical Laboratory Personnel"

Moderator: Tyra T. Hutchens, M.D., Chairman, Department of Clinical Pathology, University of Oregon Medical School, Portland, Oregon. Assistant Moderator: Patricia Ann Amos, MT(ASCP), Assistant Professor, School of Medical Technology, University of Alabama, Birmingham. Resource Persons: Herman Sturm, Deputy Chief, Office of Program Planning and Evaluation, Bureau of Health Manpower; David Seligson, M.D., Director, Clinical Laboratory, Yale Medical School, New Haven,Conn.

III. "The Role of Continuing Education in Keeping Laboratory Workers Up To Date"

Moderator: Verna L. Rausch, MT(ASCP)MS, Associate Professor and Associate Director, Department of Laboratory Medicine, University of Minnesota, Minneapolis. Assistant Moderator: Marion M. Brooke, Sc.D., Chief, Laboratory Consultation and Development Section, National Communicable Disease Center. Resource Persons:

PROGRAM, Continued

Alberta Plym, MT(ASCP)MS, University of Colorado Medical Center, Denver; Jon V. Straumfjord, Jr., M.D., Clinical Pathologist-in-Chief, Division of Laboratory Sciences, University of Alabama Hospital and Clinic, Birmingham

IV. "Providing Career Mobility Through Education and/or Equivalent Laboratory Experience"

Moderator: Elizabeth Lundgren, MT(ASCP)MA, Consultant for Medically Related Programs, Florida Department of Education. Resource Persons: Harold Levine, Senior Associate, Center for Study of Medical Education, University of Illinois College of Medicine; William Lyons, Director, New York State College Proficiency Exam Program; Lillian Long, Ph.D., Director of Professional Health Exam Service, American Public Health Association

V. "Certification and Licensure of Medical Laboratory Personnel and Accreditation of Schools"

Moderator: A.N. Taylor, Ph.D., Dean, School of Related Health Sciences, Chicago Medical School, Chicago, Illinois. Assistant Moderator: Mary S. Resh, Deputy Assistant to the Manpower Administrator, U.S. Department of Labor. Resource Persons: Howard Bodily, Ph.D., Chief, Division of Laboratories, California State Department of Public Health, Berkeley; William K. Selden, Ph.D., Consultant on Higher Education, Princeton

VI. "The Effects of Central, Regional and Other Emerging Laboratory Structure Patterns on Education, Training and Utilization of Medical Laboratory Manpower"

Moderator: Thomas D. Kinney, M.D., Chairman, Department of Pathology, Duke University Medical Center, Durham, North Carolina. Assistant Moderator: Gerald R. Cooper, M.D., Chief, Medical Laboratory Section, National Communicable Disease Center, Atlanta. Resource Persons: Norman Hoffy, Special Assistant for Health Economics, Bureau of Health Manpower, U.S. Public Health Service; George Z. Williams, M.D., Chief, Department of Clinical Pathology, Clinical Center, National Institutes of Health

VII. "Strengthening the Education and Training of Laboratory Personnel"

Moderator: William Willard, M.D., Vice President of Medical Center, University of Kentucky, Lexington, Kentucky. Assistant Moderator: Ruth French, MT(ASCP)MA, Director of Curriculum in Medical Technology, School of Associated Medical Sciences, University of Illinois College of Medicine. Resource Persons: Alfred Borg, Ph.D., Program Director, Science Curriculum Improvement Programs, National Science Foundation; Ruth I. Heinemann, MT(ASCP), Chairman ASMT Education & Research Fund, Inc.; Jerome Lysaught, Ed.D., Coordinator, Clearing House on Self-Instructional Materials for Health Care Facilities, University of Rochester, New York

VIII. "The Influence of Sociological and Economic Factors in Choosing Medical Laboratory Careers"

Moderator: Robert C. Horn, Jr., M.D., Chairman, Department of Pathology, Henry Ford Hospital, Detroit. Assistant Moderators: Catherine Milos, MT(ASCP)MA, Consultant on Recruitment and Education of Medical Technologists; Bernard Mann, M.D., President Connecticut Health Careers Council. Resource Persons: Carol Brown, Conservation of Human Resources, Columbia University, New York City; Michael Pilot, Occupational Outlook and Specialized Personnel Branch, Bureau of Labor Statistics, U.S. Department of Labor; Patricia Sussman, Director, Health Careers Program, American Hospital Association

CONFERENCE HIGHLIGHTS AND RECOMMENDATIONS

... A compilation based on significant statements and suggestions of conference speakers, symposium members and discussion groups. The recommendations have been reviewed and approved by the Conference Planning Committee. Most recommendations evolved from group discussion and combined thinking and cannot be individually attributed. They are presented in the order in which conference objectives were stated, without implications of priority or urgency.

> "It is incumbent upon all leadership groups to make sure that you don't get stuck with the patterns that served you well in the past, but that you develop the flexibility to come out where it makes sense to come out a decade hence."
>
> Eli Ginzberg, Ph.D.

Conference participants, in the spirit of Dr. Ginzberg's challenge, sought to identify outmoded practices of the past and to formulate new patterns aligned to the changes to come in laboratory staffing, personnel utilization, and standards of education and training. That such training and staffing patterns must be continuously reassessed as technological and sociological forces shape and reshape the future scene, was made clear in conference speeches and discussion.

Need for Information

Reflected throughout the conference was the need for a complete, detailed analysis of personnel requirements for operation of a modern, clinical laboratory in terms of the functions performed and the technical and professional skills required for such performance. From this stemmed three related recommendations.

Recommendation 1: There is urgent need for a study to determine and define skills and manpower requirements for present and future medical laboratory practice, with consideration of anticipated changes in laboratory methodology, demands for laboratory services, and organization, administration and delivery of laboratory services.

The study should be conducted by professional analysts. It would serve as a foundation upon which future determinations and estimates could be drawn. Activities based on other conference recommendations could be initiated concurrently with the study of job descriptions and skills.

Recommendation 2: Findings of the study of necessary skills should be employed to reassess and realign laboratory career categories and the educational and technical levels required for the categories.

Determination of the education, skills and judgment required to fill medical laboratory roles is of paramount importance not only in education and training of laboratory personnel but for the nationwide recruitment efforts undertaken to meet laboratory manpower needs.

> Recommendation 3: To measure and project manpower needs accurately, a uniform laboratory workload reporting system should be formulated and adopted nationwide.

A standardized national reporting system could be developed by coordinating the several systems presently used by professional and government organizations involved in laboratory medicine. Following development of a uniform system, the professional organizations should promote its universal adoption and use, and periodic updating of its components.

Effects of Automation

Automation and computer applications in laboratory medicine are causing a technological revolution that will profoundly affect manpower requirements. The coming changes will require a high degree of competence and specialization within existing disciplines, and the introduction of new disciplines to the field.

> Recommendation 4: An analysis should be made of the need for new specialties and disciplines in the clinical laboratory, and of the curricula and training to be developed to prepare personnel for the new roles.

Examples of new types of laboratory specialists that may be needed are servicemen whose military electronic experience can be adapted to use in the clinical laboratory, and systems analysts, data processing personnel and other graduates of technical and engineering schools.

New courses for laboratory employment might include biomedical equipment operation, already the subject of pilot curriculum studies; biomedical engineering at technician and post-graduate levels; electronics; computer programming; isotope technology. Some could be taught in junior and community, as well as four-year, colleges.

It was recommended that, in establishing new laboratory specialties, staffing patterns should be kept flexible and reviewed regularly to consider new titles, new opportunities for different types of personnel, and new responsibilities.

Attracting and Recruiting Manpower

> "Competition for talent has put recruitment on stage, front and center...Those who are determined that the health careers shall have a fair share of the nation's top talent will have to accept the fact that competition is a permanent part of the recruitment process, and make the most of it."
>
> Kevin P. Bunnell, Ed.D.

> Recommendation 5: Allied health careers should be promoted by directing information on laboratory as well as other health careers to science teachers, guidance counselors, librarians, parents and students starting as early as upper elementary grades.

Career information should be offered as a joint exposition of the roles the various workers fill in patient care, leaving the student to decide which best matches his interest. Cooperation with health career councils can help direct attention to medical teamwork and to science courses preparatory to medical care and research. The combining of career opportunities may help offset the competition with other science fields for manpower.

Recommendation 6: Recruitment efforts should be directed to new sources of manpower.

Medical laboratory careers must appeal to a broader range of aspirations and abilities than is the case at present to meet the needs at all levels -- i.e., scientists, technologists, technicians, and assistants.

It was urged that clinical laboratories recruit and welcome to their field more scientists trained in the fields of chemistry and physics. With these individuals responsible for obtaining scientific data and supervising automation, medical technologists could concentrate on areas related to patient care in which judgment provided by medical orientation is needed.

Others who with proper preparation could serve in the medical laboratory: (1) economically and educationally underprivileged persons with ability and talent; (2) handicapped individuals whose disabilities do not preclude laboratory work; (3) inactive medical technologists; (4) married women with science backgrounds who want to enter or re-enter the labor market; (5) older age groups with interest in science, including retirees with adaptable skills; (6) persons with outmoded technical skills who can be trained.

Specific efforts should be aimed at recruiting armed service veterans who received training in military laboratory programs, as well as those with experience in electronics. Low salaries and lack of prestige at the levels for which they qualified have deterred veterans from seeking civilian laboratory jobs. Dr. Eli Ginzberg said on this: "You must take advantage of the male manpower who have some background interest and competence in your area. That means that you must look very carefully at too rigid educational qualifications for certifications and promotions. Or you must build in an easier system for them to pick up their undergraduate degrees."

It was proposed that men leaving military service be provided with information on laboratory careers, and encouraged to use "GI Bill" benefits to obtain the education and training that will qualify them for satisfying laboratory positions.

Education to Think

"If you only train somebody, he may well be left out in the cold if you introduce new procedures and new techniques...if, however, he has been educated to think, he has acquired certain patterns of thought, certain ways of establishing qualitative judgments, and therefore has the background to live with change and himself encourage improvement."

Calvin Plimpton, M.D.

Recommendation 7: Laboratory professionals should cooperate with educators and science education groups to help upgrade the quality of science education in elementary and high schools.

Participation by laboratory personnel in Science Fair projects is one method of offering cooperation to science teachers and of demonstrating the relationship between science courses and health careers. Other joint efforts between laboratories and educators may follow such preparation.

Students in rural and overcrowded urban schools are often barred from health careers because of poor preparation in science. Special courses could be developed to help students without adequate science backgrounds enter medical laboratory training and jobs. Such courses might be given in mobile laboratories, summer courses, and in junior colleges; as refresher programs, correspondence courses, over closed circuit television, or as programmed instruction.

A general improvement in the quality of science education might be effected by stressing its importance in the laboratory career information directed to elementary and intermediate levels, and often seen by school officials and parents.

> "The community college movement is growing at a rate which is hard for most people to comprehend. As new colleges are founded, you...will want to assure yourselves that the health professions are adequately represented in the curricula of these institutions. More specifically, you will want to be sure that quality courses and programs supportive of the medical laboratory careers are available."
>
> Kevin P. Bunnell, Ed.D.

> Recommendation 8: Assistance and guidance should be provided junior colleges and vocational schools in developing educational programs leading to medical laboratory careers.

Courses of sound academic quality related to medical laboratory skills, such as general biology and applied mathematics, chemistry and physics, are needed in junior and community colleges if they are to produce medical laboratory personnel. The advantage for laboratory careers of developing courses that permit transfer of junior college credit to four-year baccalaureate programs was stressed, as well as the importance of informing students entering terminal junior college programs of such courses' limitations in terms of future mobility.

Exactly where terminal graduates of junior and community colleges will fit in the laboratory of the future remains uncertain pending the recommended study of the knowledge and skills required for different assignments. The possibility of training these graduates specifically for general duty in small community hospitals was suggested. It was recognized that minimal if not non-existent supervision in such situations makes this problematical.

Dr. Ginzberg put forth the controversial proposal that science requirements for medical technology might be "squeezed into the junior college" by asking: "What part of your educational requirement is real and what part is spurious or snobbish?"

> Recommendation 9: Colleges and universities should be encouraged to strengthen baccalaureate curricula for medical technology education, and the current three-year college plus one-year clinical training system should be reviewed.

It was pointed out that professional personnel in medical laboratories will increasingly need education for flexibility -- the ability to acquire skills not yet identified -- to adjust to rapid changes in services, procedures, and skills required.

The importance of improving medical technology education in both the academic and clinical areas was stressed by Leanor Haley, Ph.D., MT(ASCP) in criticizing medical technology programs that "do not stimulate students, offer no challenge. We end up in many instances with rote workers...who cannot do work that we are going to have to do in the laboratory." She suggested that partial solution could come from the establishment of Colleges of Allied Health Professions, which offers "a new approach to the training of medical technologists. We get them earlier and we can set up a whole new curriculum."

Also suggested was development of core science courses for all college students preparing for health fields. This would permit joint use of faculty and laboratory facilities, strengthen recognition of the health team concept, and allow for mobility between health careers.

Development of guidelines for meaningful affiliation between colleges and universities and the clinical hospital schools affiliated with them was strongly recommended. If the clinical year of training is to be recognized by graduate schools as a bona fide college year, clinical and academic programs must be more closely coordinated to assure an educationally sound experience.

While it was recommended that teachers of laboratory personnel should devote major time to teaching responsibilities, it was felt that they should also retain some role in the laboratory to keep in touch with day-to-day activities.

Recommendation 10: Graduate education for medical laboratory personnel should be strengthened and expanded.

Increased graduate opportunities will lead to positions with greater responsibility, higher salaries and more prestige for medical technologists, and will attract persons of higher ability and talent to the field. Graduate programs were recommended in immunochemistry, genetics, and other sciences for specialists; in administration and systems management for supervisors; in educational methodology for teachers.

Increased numbers of scholarships for graduate study by medical technologists were suggested, as was the establishment of scholarships to make it possible for a few medical technologists to attend medical school.

Learning to Keep Up to Date

> "The essence of continuing education is helping people to grow...It is associated with a spirit of curiosity. It is important that the institution have this attitude of curiosity. It is typical of the attitude of good physicians, good technologists, and this attitude will be most responsible for progress in the future."
>
> Calvin Plimpton, M.D.

Recommendation 11: Continuing education programs for medical laboratory personnel should be expanded and strengthened, and better methods for coordinating and evaluating them developed.

Continued acquisition of knowledge and expertise by laboratory personnel at all levels is essential. An inventory and clearinghouse of continuing education courses would help coordinate them and bring them to the attention of additional personnel. Evaluation of continuing education courses should be assigned to a responsible agency.

An "enlightenment" program on the value of continuing education might motivate laboratory directors and hospital administrators to adjust working schedules to provide staff time for courses, thereby stimulating wider participation. Establishment of in-service programs, such as seminars, educational staff meetings, instruction on new developments and methods, during working hours, was recommended.

It was suggested that grants be made to encourage medical centers to provide post-graduate continuing education courses, including instruction on how to conduct continuing education programs that would generate satellite programs. The Public Health Service should be encouraged to augment grants-in-aid programs such as those for advanced medical technology traineeships under the Allied Health Professions Personnel Training Act administered by the Bureau of Health Manpower, and the support for graduate study initiated by the Cancer Control Program.

Members of one discussion group urged that the Bureau of Health Manpower seek the advice and assistance of the medical laboratory field in coordinating government programs related to continuing education for this field as well as for the allied health professions in general.

> "Is it really necessary for teachers to mouth what has already been put into print? Attitudes are another matter. How to sterilize a syringe is different from making sure the syringe is sterilized before it is used on a patient. These simple attitudes and the more sophisticated ones can only be taught by contact with the competent instructor."
>
> George A. Wolf, M.D.

Recommendation 12: New curricula and teaching methods should be explored, with experimentation encouraged, and self-instruction in laboratory education should be utilized more effectively.

If clinical work is to be part of the degree requirement, affiliated colleges and universities should more closely integrate academic study and clinical experience, in line with the ideas presented under Recommendation 11, and the colleges and universities should take more responsibility for the total educational experience. The possibility of programming the clinical training after four years of college or as an integral part of the baccalaureate program was raised.

Dr. Wolf pointed out that substantive information can be learned from books, film strips, teaching machines, closed-circuit TV and other tutorial aids. These self-education media should be exploited more fully to help students acquire information and develop skills on their own, to bring their knowledge up to the point where the skilled teacher is most effective.

A further recommendation was that outmoded rules on educational qualifications be modernized, rigid reliance on clock hours or course units being replaced with more effective mechanisms for demonstrating competence. Creation of more flexible examining systems might increase experimentation and progress in education and training.

Mobility and Manpower

> "Wherever we have a profession with a compensation structure which is rigid...where there is no place to go at the top, recruitment of talented individuals will be difficult."
>
> E. R. Jennings, M.D.

Recommendation 13: Career opportunities in medical laboratories should be improved, and financial rewards provided at the top that will attract and retain more professional administrators and other specialists.

Low salaries are a major recruitment deterrent. They tend also to make for a predominantly female work force, a situation Dr. Ginzberg called unhealthy in its effects on career continuity and its drag on wage rates.

Entering salaries should be at least comparable with those of other professions requiring similar education and proficiency. Salary schedules should offer a series of levels based on competence and responsibility that enable qualified technologists to move into supervisory and administrative positions up to a suggested position of assistant clinical director. There should be a reasonable number of positions at the level of $15,000 and above.

Efforts should be made to insure effective utilization of laboratory personnel and adequate opportunities for advancement. Personnel trained and employed below their capabilities should be able to obtain education or training leading to higher positions without starting in again at the bottom of the academic ladder. Educational programs should be designed so that students who do not want to stop at given points in the career ladder, may use one program as a stepping stone to the next.

Ladders of opportunity are especially important for minority groups, it was emphasized by Montague Brown, as "these are the groups who can least afford to be boxed in. They are less likely to be able to get back into school and go up a ladder outside the job structure."

Recommendation 14: Representatives of medical laboratory disciplines should initiate efforts with educational testing specialists to develop equivalency tests to provide increased mobility between levels and categories of laboratory careers.

Equivalency tests would make it possible for individuals to obtain science credits needed for advancement through recognition of self-study, experience, maturity and skills gained on the job. Construction of adequate equivalency testing instruments would be facilitated by the basic study defining essential skills for the categories of laboratory employment. Methods developed to equate experience with education and training can be used to evaluate correspondence, television and continuing education courses as well as to enable graduates of armed forces laboratory programs to enter college or medical technology training without meeting traditional academic requirements.

Efforts should be made to ensure recognition of equivalency tests by boards certifying and licensing laboratory personnel, and for admission to and advanced standing in colleges and universities.

Development of equivalency tests would enhance the appeal of laboratory careers. The recognition of knowledge gained outside of formal education to fulfill academic and clinical requirements would give persons with initiative and ability opportunities for advancement.

Licensure, Certification, Accreditation

"What you must decide is whether you prefer state or federal controls, because some kinds of controls obviously have to come. The question is simply, what system of control makes sense?"

Eli Ginzberg, Ph.D.

> Recommendation 15: The agency administering a licensing program for clinical laboratory personnel should have an advisory board of representatives of the scientific disciplines involved as well as knowledgeable representatives of the public.

Professions affected by laws and regulations should actively participate in their development. Anticipating licensing legislation, the professional societies and academic institutions involved in the training of medical laboratory personnel and the state health departments should seek closer cooperation and communication in order to better identify and assess each other's views.

It was suggested that state laws adopt, as qualifications for licensure, standards established by national medical and scientific organizations such as the standards used by the AMA's Council on Medical Education in approving AMA-accredited schools of medical technology. Standards should be flexible to keep pace with changing technology.

Licensure should apply primarily to individuals responsible for performing tests and arriving at results requiring scientific judgment. Accordingly, only the professional staff of medical technologists, laboratory scientists and other supervisory personnel should be included. In furtherance of the primary objective of certification and accreditation -- to maintain and improve quality -- emphasis should be on qualifying rather than disqualifying programs and persons.

> Recommendation 16: Accrediting and certifying agencies should explore possibilities and ways of offering their services to all schools requesting evaluation, and to graduates of non-accredited programs applying for certification.

Accreditation of schools serves the objectives of identifying qualified schools for the public and the profession, stimulating the development of good educational standards, and providing a guideline for licensure requirements. Establishment of a universal accreditation agency for all schools and personnel desiring evaluation would facilitate achievement of these objectives and eliminate confusion caused by multiple registries and accrediting groups.

INTRODUCTORY REMARKS

Donald R. Chadwick, M.D., Assistant Surgeon General,
Director of National Center for Chronic Disease Control, USPHS

I am delighted to be with you as you begin your examination of our local and national problems regarding manpower for the medical laboratory. From what I have seen of the agenda and issues listed for discussion, the examination promises to be comprehensive and intensive.

Almost all the diseases that our National Center for Chronic Diseases attempts to control -- cancer, heart disease, respiratory diseases, diabetes and arthritis, kidney disease, neurological and sensory diseases -- involve at some step or other one or more laboratory tests. Obviously, our pursuit of excellence in health services succeeds only if your pursuit of excellence in laboratory services succeeds.

In almost all of these diseases we find the amount of laboratory work increasing per patient. What is more, we find the methods as well as the instruments used by laboratory personnel constantly increasing in number and complexity. New knowledge and skills must be developed to cope with these changes. At the same time there can be no relaxation in the accuracy of taking and reading the tests, both old and new, that are so vital to the discovery and treatment of chronic diseases.

You are not going to come up with easy answers in discussing the recruitment, training, and utilization of people who can work in the medical laboratory. Putting those answers into effect will be even more difficult. But I do want to assure you -- if I may speak on behalf of the entire Public Health Service -- that the Federal Government is eager to receive original ideas, eager to give support where it is needed.

There are thousands of young persons with the capabilities we need. Our first problem is to find these youngsters. We shall need to pursue some original and innovative approaches if we are to succeed. Our second problem is to construct a career ladder which will help them reach their highest capabilities. They must find pride and satisfaction in their jobs. This is necessary to insure high standards and quality in their work. Concern for the welfare of the patient must be the primary motivation of every laboratory worker -- a personally professional ethic. Lives will depend on how well they do their job -- and hence, on how well you do your job here.

RECRUITMENT--A PART OF THE LIFE-LONG EDUCATION OF THE MEDICAL LABORATORY PROFESSIONAL

Kevin P. Bunnell, Ed.D., Associate Director,
Western Interstate Commission for Higher Education

Whenever there is talk of health manpower shortages there is bound to be talk also about the recruitment of new talent for the health professions. Hence, this speech comes as no surprise during the course of a conference on "manpower for the medical laboratory".

I want to begin by painting in very broad strokes three basic conditions which seem to set the ground rules for recruitment for any of the health professions. Then I will make a number of rather specific suggestions for the consideration of those of you who are concerned about the recruitment and retention of manpower for the medical laboratory professions. And finally, I want to discuss the problem of maintaining the relevance of the profession in the rapidly changing world. Throughout this talk it will be obvious that I view recruitment not as a single brief event in the life of the individual, but as a continuing process which may touch him often in the course of his professional career. And from the point of view of the recruiter, recruitment requires not just a little information to convince the ambivalent youth, but requires a comprehensive grasp of the status of the profession and the issues it faces.

The lack of educational facilities has been a serious bottleneck in the production of health personnel. We are now moving more rapidly than we ever thought possible to build the schools and other facilities where health professionals can be trained. Serious shortages are still with us. Unless we maintain and even quicken our present pace of facilities construction, we may find ourselves in the embarrassing position of recruiting students for educational opportunities that don't exist.

Another basic problem that recruiters must face will not respond as readily to human efforts as has the facilities problem. Until just two or three years ago, the age group from which we drew students for health careers was relatively small -- the result of a declining birth rate during the depression. The jump in 18 to 21 year olds will be felt very quickly in the health careers which require only undergraduate training. In those professions which demand study beyond the baccalaureate level, the impact of this change will not be felt until the 1970s.

Ultimately we will produce enough trained young people to meet our health career needs. The immediate question is how we can hold on until the health professions can reap a richer harvest from the increased human resources which eventually will be available.

Given the limited pool from which all professions must draw their new members, one of the most serious problems faced by the health groups is competition with other professions for available talent. Today there are some 2,200 careers which require specialized training; a hundred years ago medicine, law, theology, and teaching were virtually alone in this respect. Many of these new professions offer prestige and remuneration comparable to that of the health professions and yet require training that costs much less in both time and money. Competition for talent has put recruitment on stage -- front and center. But the health professions, some of them at least, have been rather slow to get into the act. Other professions, uninhibited by traditional reservations about recruitment, have moved into the high schools and undergraduate colleges with attractive financial offers and descriptions of new and exotic careers. With these inducements, they have drawn many young people away from the health professions. Those who are determined that the health careers shall have a fair share of the nation's top talent will have to accept the fact that competition is a permanent part of the recruitment process, and make the most of it.

To obtain top-notch talent, medical laboratory professionals must add new dimensions to their recruitment programs. They must see recruitment as more than the process whereby laymen and professionals work together to inform students of career opportunities. They must see it as part of a lifetime of education and development in which obtaining career information is only one early step. To understand this concept of recruitment one must be concerned with the dynamic continuum from preprofessional training through career selection, professional education, and practice, to continuing education. The concern for manpower and recruitment must embrace the whole process.

Recruitment should be aimed, of course, at new young students for the profession, but it can also reach out to the older age groups which may also be drawn to the medical laboratory field. Consider, for example, the mature person with all or part of a college education who has an interest in science and wants to continue learning. Such a person should be sought out and encouraged to bring his interests to focus on a medical laboratory career. So, too, with the person with an outmoded technical skill who seeks retraining in one of the allied health fields.

Medical laboratory educational programs should appeal to a broad spectrum of student aspirations and ability. The laboratory field is comprised not merely of Ivory Tower scientists, but of technologists and assistants concerned with meeting the dynamic needs of a rapidly evolving health care system. Commitment to these careers should not be the special prerogative of the intellectually gifted. The laboratory professions can and must draw recruits from a broad manpower base.

In addition to recruiting from new sources, laboratory professionals should be concerned about the conservation of talent already in the medical laboratory or related fields. The person who has been trained and employed at a level below his fullest capability should be able to reach out and find new educational opportunities which will permit him to move to a higher level in the profession without starting again at the bottom of the academic ladder. Such educational programs will have to be flexible and experimental. Though difficult to design and implement, they can be a most effective means of making optimum use of available talent.

It is also time for the professions to take a hard look at the role of women in health careers. We tend to take the fatalistic view that most of the women we train will soon drop out of the profession. I think that the medical laboratory people, like the other allied health groups, can do something about this. They can initiate studies of the factors which influence the decisions of women to enter laboratory careers, and to leave them, and to re-enter them. Such studies may reveal clues as to how we can retrain women as active members of the profession. If new kinds of educational programs are needed to accommodate the life patterns of married women, then the profession should take the initiative in developing them. At present we are failing to use to fullest advantage that half of our manpower pool which happens to be female. This situation must be remedied.

The medical laboratory profession should be continuously aware of local and regional health manpower needs and how they relate to the employment potential for laboratory personnel. This may involve extensive research which may be carried on most effectively through local chapters of professional associations. Such research could be geared primarily to studying the demand for laboratory talent and the availability regionally of technological manpower to meet this demand.

But manpower research should never be allowed to become an end in itself. And the lack of sophisticated manpower data must not block action in the face of obvious need. Some manpower specialists take the position that we are so far from meeting our needs in all of the health careers that we should spend less time spelling out needs and more time providing opportunity for more students to enter health careers. If I had to choose between the two, I would spend my time studying ways of increasing educational opportunity rather than analyzing the details of health needs.

In many ways the individual health professional -- the doctor, the nurse, the technician -- is a national and a regional, rather than a state or local, resource. The American people are very mobile. They don't necessarily practice where they obtain their education. The fact that a given state is relatively well supplied, for example, with medical laboratory personnel does not mean that that state should slacken its efforts to educate such personnel. Instead, it should continue to prepare its share of the national pool. We might better concentrate steadily on providing more students with better study opportunities in the health professions than try to adjust our efforts to the changing winds of local supply and demand.

Those who are concerned about the quality of students entering medical laboratory education programs should take a hard look at the secondary school programs which have produced these students. All of us are aware of the steady upward trend in the quality of high school curricula, especially in the sciences. Better high schools everywhere are now providing some courses which are the equivalent of first-year college work. But it would be a mistake to assume that the quality of high school studies is uniformly high. Those of us who live in the sparsely populated states know that there is reason to worry about the quality of science education in the remote high schools. The fact is that students from rural high schools tend not to aspire to careers in the health sciences, or, for that matter, in engineering or in the other disciplines requiring strong science and math backgrounds. The obvious answer is that science programs in remote high schools are often not up to par. Students from these schools find that they are simply unable to compete with the better prepared students from metropolitan areas. They respond by turning their career aspirations in other directions. I think none of us would want to take the position that we will simply write off the graduates of rural or underdeveloped high schools. Talent is a precious thing and it deserves to be cultivated wherever it exists. I hope that those who are committed to recruitment for the health professions will work actively to see that the quality of science programs in underdeveloped schools is upgraded. Then the potential of these students can be added to the pool of those who aspire to careers in the health professions.

The junior college or the two-year community college is another resource for allied health manpower. The community college movement is growing at a rate which is hard for most people to comprehend. As new colleges are founded, you who are interested in promoting the health careers will want to assure yourselves that the health professions are adequately represented in the curricula of these institutions. And more specifically, you will want to be sure that quality courses and programs supportive of the medical laboratory careers are available.

Successful recruitment depends a great deal upon the sensitiveness of the laboratory professional to social, economic, and political forces, as well as to educational trends. Effective medical laboratory recruitment and educational programs must be shaped by a thorough knowledge of the impact of these forces on health careers. Automation, population shifts, and changing income patterns can have a significant impact on medical laboratory practice, as can such federal legislation as Medicare, the Allied Health

Professions Act, and the Heart, Cancer, and Stroke Regional Medical Program. Keeping up with forces such as these can involve considerable study and research.

Medical laboratory professionals should encourage such research. They should also encourage research designed to test the effectiveness of their educational programs by studying their impact on students and on health professionals. And they should be interested in other researchable matters such as the causes of attrition in the professional schools, the characteristics of students, and the processes of career decisions.

Research is simply a means to make wiser decisions concerning change. Those who favor progressive change cannot fail to support research as one means toward that end.

Thus far I have been talking mainly about recruitment for the health professions, and more particularly the laboratory professions, as part of a life-long educational process. Because I tend to see the whole process rather than the separate parts I find it difficult to talk about recruitment alone. I really want to talk to the whole laboratory profession and not just to those who are overtly concerned with recruitment and manpower problems.

The text for what I am trying to say is Socrates' phrase, "the unexamined life is not worth living". By this I mean simply that the laboratory professional who is really concerned about his profession and education for it, must constantly re-examine that profession and the educational programs associated with it. I am assuming that you people are here because you want to live the "examined life". I am glad you've come because I think that the laboratory professions may be in need of a close look. I am wondering if in the long run there is going to be a medical laboratory profession as we now know it. I can think of two or three scientific and technical developments that could change the profession so that we would hardly recognize it. Consider these possibilities:

1. Cancer becomes a controllable disease, no more common than polio.
2. The present technology for telemetric monitoring of human vital signs is perfected -- to the point where a patient can simply sit in an instrumented chair for 30 seconds, with nothing attached to him, and have all of his vital signs recorded and fed into a computer for instant recall by his physician.
3. A technique is developed for analyzing body fluids in situ so that blood, urine, spinal fluids, and even specific areas of tissue can be analyzed almost instantly by a machine that never needs to touch the body. Sounds like science fiction, but I think you'll agree that developments such as these would change the face of your profession.

There are a couple of very interesting things about changes like these. First, most of them will be developed like the atomic bomb -- by teams of specialists who have no collective sense of concern about the impact of these developments on the profession that will use them. And second, medical technologists will have very little to say about whether these developments will be implemented as part of regular laboratory procedures. The public will demand access to new developments like these as soon as they are available.

So here is a profession already in the midst of a technological and scientific revolution over which it will have comparatively little control -- but which could radically change that profession.

What does all this mean for people like yourselves?

Come back to my point about the examined life. Laboratory professionals at all levels who expect to be leaders and who care about their profession, must lead the examined life; they must manifest one of the surest signs of a maturing profession -- a continuing concern for the welfare, the quality, the dignity, and the effectiveness of the profession. They must keep their antennae extended; they must be aware before all others of impending changes that may touch the profession at its roots. And being aware, they must be ready to act, for action is the best strategy in the face of radical change. They must be ready to act to see that the curricula in the professional schools are relevant to the professional world as it will be -- not as it is. They must act so that those who are recruited are able to grow and change as this rapidly changing profession will require. And they must act so that the preprofessional programs are as relevant in their way as the professional curricula are in theirs. And they must act so that the leadership in the profession really leads, adjusting its programs and positions to impending reality instead of being dragged from decade to decade by others outside the profession who function as leaders because someone has to fill the vacuum.

The key word in all this, indeed in all of education, is relevance. The lack of it has rocked American education to its very roots -- all the way from Berkeley to Boston. The real challenge for those who care about the medical laboratory profession is to see that the whole process from preprofessional training through continuing education, including recruitment and the practice of the profession itself -- that the whole process remains relevant to the changing world as it is continuously revealed to us. For more reasons than I can rehearse here, the infusion of relevance is a tough task -- but this is one of the problems you have come here to tackle. Go to work!

STATEMENT OF OBJECTIVES

Leonard D. Fenninger, M.D., Director
Bureau of Health Manpower, U.S. Public Health Service

The laboratory is at the heart of health services. Doctor, patient and health service administrator must have confidence in the laboratory's test results, as well as ready access to them.

These they cannot have if:
Laboratory facilities are overloaded
Laboratory facilities are understaffed
Laboratory facilities are confronted with new tasks without adequately prepared personnel

All these conditions, it seems to me, bear heavily on manpower.

When Dr. Sencer said this spring that 25 percent of the laboratory determinations performed were in error, I am certain that, if a way could be found to determine which 25 percent of the laboratory determinations were in error, they would be found among those laboratories that are overloaded, understaffed, or where personnel are inadequately prepared for the new determinations that laboratories are being called upon to make.

That is why we are here to consider problems that are central to the delivery of modern laboratory services. In our consideration of these problems, we shall be particularly concerned with those forces that have been released as the medical laboratory and the systems which impinge upon it have developed in the last half of the 20th century.

For almost 40 years, before any of the rest of us were contributing to training for this field, organized pathology shouldered the responsibility of developing training programs, establishing standards and certifying programs. These people foresaw the shortages, and together with the Medical Technologists developed a national recruitment program. As a further aid to providing sufficient manpower, they developed formal training programs for high school graduates as laboratory assistants.

Nevertheless, in 1965 by some counts there were only 3300 students graduating from medical technology programs in the United States; and in 1966 the need for additional Medical Technologists to supply optimal care was estimated at 9200. Although these figures are far from firm, even the most conservative reading of them would indicate a wide gap between supply and need. This scarcity will go on as in all the health professions because it takes time to train medical technologists and because the need is now. Until the five objectives which have been set for this conference have been brought into continuing dialogue among all health interests, public and private, inadequacies in laboratory services will continue to haunt us. Exploration of these is essential.

THE SOCIAL AND ECONOMIC OUTLOOK

Eli Ginzberg, Ph.D., Director
Conservation of Human Resources, Columbia University

My presentation this morning will be composed of three parts: the first will discuss manpower trends; the second will be concerned with medical technology and laboratories; and the last will raise some policy issues.

I will begin with some simple observations. The first is that the tremendous expansion of health services in the United States is a result of the overwhelming expansion of paramedical manpower. This is not to deny the critical importance of the physician in the total scheme of the health services. We have 100,000 or more physicians today than we had at the beginning of the century, and their training has been improved considerably. Nevertheless, physicians are a small and diminishing proportion of the total. The fantastic expansion of services which has occurred in health, as in every other sector of the economy, has come about through specialization and the use of less expensive personnel to do a job. If we were still using the manpower constellations that were in use at the beginning of the century, we would have a health service many times more deficient than the present one.

In a certain sense, the problem is only part of a larger problem which is the articulation of a tremendous number of specialists at less than physician's level who provide health services. There are about three million people in the health industry today.

The second point concerns policies made by Congress. The Congress has made all kinds of new monies available; that is, they have poured money into medical research over the last fifteen years. And recently the Congress has taken the radical step of identifying and earmarking funds for Medicare and Medicaid. However, I am a student of social institutions, and I am impressed with the fact that it is easier to change the money stream than it is to change the manpower stream -- that is, the organizational arrangement with which people and money have to be put together in order to provide services. I believe that the Congress made an error by jumping too fast into this field without a better understanding of it.

The attempt to improve health services for the poor was presumed to be easier than it actually was because the Congress had the naive notion that only money was involved. Of course the Senators and the Congressmen understood that research and manpower were involved too, but I am afraid we will spend the next ten years attempting to put the money and the people and the organizations together in a more rational fashion. The new infusion of money may worsen for the time being the ability to deliver services to the people who need them -- just as much as it will improve the delivery of services. I saw some shocking figures yesterday! Several large hospitals in New York were being reimbursed at the rate of $55 a patient day last year and this year they are being reimbursed at $94. I then saw some figures which indicated that clinic reimbursement rates in certain New York hospitals had gone from $4 to $24! But we are a rich country and will survive this as we have a lot of other things, but in the meantime, the atmosphere will be disturbed.

The third point is that increasingly ours is a skill economy. The kinds of skills which we need and can use is very much a function of the technology which sets up requirements, on the one hand, and of the general and the special education and training structure on the other. This is a balancing between what the scientists and technologists can discover and put into effect and the level of competence in the population to cope with it.

In the 1930's, Vannevar Bush argued that we get a very much smaller than optimal use out of our technology because of an insufficiency of skill among the population. In this country, by virtue of our history, we have a peculiar approach to matters of skill in that we assume that quantity has some kind of a direct relationship to quality. If you are missing an Einstein, 10 Ph.D.'s in physics will make it up. But it doesn't work that way with regard to skill. You cannot get the desired balance in many instances by merely increasing the resource input. When Dr. Fenninger mentioned that one of your problems is overloaded laboratories, it struck me that unless you can teach the young medical students and the public in turn, what should be done and what should not be done in the laboratory, there will always be overloaded laboratories because if the students get too passive and want to run all kinds of tests, you have too many tests run. In a world in which everybody is entitled to the best medical care, the patient will determine a large amount of what the doctor is going to do or not do. If the doctor doesn't run tests on Sadie that some other doctor ran on Mary, Sadie's going to leave because she's not getting, in her opinion, as good attention as Mary got. This is a very real part of a real world of medicine. And as far as I can judge from my exposure to American medicine, the passivity that is part of higher education in the training of physicians is unfortunate, and it's one of the reasons that the laboratories are overloaded. This comes back to the question of skill.

Now, the next point is that the labor force is being transformed. After 350 years of delay we have suddenly decided that perhaps we ought to integrate the Negro into American democracy -- at least some people believe that. But this morning's newspaper states that the unemployment rates have moved up again because of the revolution in womanpower. That is, more and more women are spending more and more of their lives in the labor force. In any approach to manpower, one must have a window open to two major revolutions -- one on a racial front, and one with respect to female resources.

The fifth point is that we can expect annual expenditures for health services to move rapidly from 50 to 100 billion dollars within the decade. When the general treasury is opened up for the support of health services, it can be very expensive. In addition, however, we must anticipate considerably more planning and control than we have yet seen. As Dr. Fenninger pointed out to you the Federal Government now is involved in "qualifying" laboratories and other institutions for access to this flow of funds. If we do the control job well, that may stop us from squandering our money. At least it is a new dimension in American medicine.

The next point is that this country embraces a continent with gross differences in income, educational levels and patterns of living. Yours is a national organization concerned with national standards and I submit that one of your most difficult problems is to find a reasonable balance between national standards and regional adaptations. Since health services are delivered locally by people who tend to be trained locally, it is simply not possible to establish and maintain standards for any specialist but physicians. We haven't succeeded even at this level. The reason we have so many foreign physicians in the United States is that certain parts of the United States cannot get medical coverage except through foreign physicians. Even at the physician's level we do not have a national standard. One of the great difficulties in all service areas, and particularly in health services, is to use standards and professional leadership to improve circumstances but not to permit them to get out of balance so that the work cannot be performed at state and regional levels.

The next point is that skill is usually acquired after schooling, not before schooling. We like to believe that education is the essence of skill acquisition, but the medical school per se is the shorter period in the training of a physician; it is the hospital which counts the most. More physicians today are undertaking residencies; today more time is spent in internships and residencies than in medical school. The formal education part is the smaller part of skill acquisition for doctors. It is important to remember this when it comes to standards and certifications and licensing, in which undue emphasis is sometimes placed on the formal educational achievement and inadequate emphasis on the experience and skill acquisition that comes on the job.

The next point is that even though there are a lot more dollars coming into the health field, and more and more will come, the whole of the health field is becoming increasingly organized at every level. We will soon have an interesting pattern in this country of struggles for the division of the dollar. The British have had this pattern ever since they established National Health Service. As the nurses get organized to improve their standards and as the standards of the medical technologists are improved and as people up and down the line organize to improve themselves, there will be some difficult problems in the economics of distribution.

Until now the distribution has been very simple. The medical profession has been able to exercise the dominant influence in determining that part of the money which has gone for reimbursement of personnel. The poorly organized, poorly skilled, poorly educated rest of the profession divided the remainder. But this is changing because the physician himself represents a much smaller part of the total industry today. It's changing because the hospital and other health institutions become the more important center for delivery of services. I was amused last night, when several of the physicians in the audience explained to me that of course the costs of medical care are going up -- not because the physicians are making a lot of money, but because the technologists are making too much, and the nurses are making too much, et cetera. But we're just at the beginning of this. Since there is no logic to the distribution of the medical dollar there will be a lot of political hauling and pulling and organizational efforts.

Against these more general remarks, let me take a somewhat closer look at your field, and tell you what I as an outsider see. We hear about shortages in medical manpower, but we hear about a lot of other shortages. There are shortages of school teachers. There are shortages of business managers. There are shortages of steel workers. When the country is affluent, as it fortunately has been and continues to be, shortage is the nature of the case. It is the result of affluence. In the 1930's, you could hire a nurse for board and room. It was then that there was a big increase in nursing personnel in hospitals because they were paid nothing and they were happy to work for their keep. They worked eight hours a day; they worked sixteen hours a day on split shift. Cries of shortage in general are merely symptomatic of affluence.

The field of medical technology has shown tremendous flexibility over the last years. There has been a three times greater increase in medical technologists than in the medical field as a whole. And the medical field has had twice as much manpower attraction as the rest of the economy. That means your field is six times better in attracting and holding onto people than the rest of the economy. And after all, we do live in a competitive world.

Secondly, when the AHA makes a survey of hospitals and asks each hospital, "How short are YOU?" each one inflates his figures. Even so the total shortage in all the hospitals in the United States is about three thousand. This does not seem to be an overwhelming shortage especially since the figures are inflated. That doesn't mean that you will have no problems over the next decade. Problems there will be, but I am trying to put them in some perspective. If we knew why your field is doing so well you might have the answers to your future problems. I have a few hunches about why your field is doing well, unlike the nurses. There are almost a million people in the nursing field. In medical technology there are less than 100,000. There is a ten to one ratio between these two fields. That in itself means that it is somewhat easier for you. You don't have the problem of the tremendous numbers. That is part of the story. The second part is that you were lucky enough or smart enough or a combination of both to become coordinated with the educational system early. You are in with the educational system. You give degrees. The nurses generally don't. Your advantages then are that you are tied up with the educational system and you don't need so very many people.

The next point is that medical technology is one of the few fields in which people below the level of physicians are allied with physicians in an apparently effective organization. Now I don't think that has no drawbacks, and I'll come to those, but it has certain advantages. It is rare to find physicians relaxedly associating with people who are not physicians. I commend the pathologists for their farsightedness and I commend the technologists for their flexibility in having made this alliance. It is an important source of strength. It leaves you with a single organization to deal with licensing boards and with hospitals.

Another point is that within the medical technology area, you have some flexibility; you have at least four types of people within the same organization. There are medical technologists with some specialization, at the top of the group; there are medical technologists who are certified; there is a small group of cytotechnologists; and then there are Certified Lab Assistants. That shows more flexibility than most professional organizations. It's a wise flexibility because you are working closely with each other and each group must be considered in relationship to the other.

The next point is that automation is going to redound to your benefit. In most service industries, such as mine -- the potentialities of automation are limited except in small areas. You can teach languages with machines, you can teach a little of simple mathematics, and a few other fields where the logic of development is very simple. But in terms of chemical and hematological testing technology has already made many advances and will make more. That's not true in many parts of medicine, but it is an advantage for your field. And you should enjoy it, exploit it, and benefit from it.

The next point is that your field is riding the right kind of a trend. We will soon move increasingly to larger medical institutions and affiliations, larger hospitals, larger hospital systems, and the economics and efficiencies of laboratories will be assisted thereby. That is, to the extent that the world of improved communications will permit more centralized laboratories, you can establish standards and maintain standards and make better use of your manpower than when you have a large number of small installations. Now the paradox to a manpower specialist who considers your field is that the smaller the institution the better the technologist has to be, because the more he's called upon to handle a wide range of clinical testing. That's not an easy way to structure a field because from the point of view of manpower economics competent people should be in large institutions. The workload ought to be greatest where the skills are greatest. Consequently, it is only through the re-structuring of the hospital system and the laboratory system that you can make further significant gains in your manpower program.

The next point is the female revolution. Medical technology is an overwhelmingly female field. Now I believe in women, I even write books about women (which is a foolish thing for a man to do) and I like women; I have daughters as well as a wife. But it is not healthy for a field if 85% of its personnel are women. It is unhealthy because it affects career continuity and more importantly, this creates a drag on salary levels. One of these days we will recognize women as equal or even superior. Since women live an average of 7 years longer than men, their superiority seems clear. They talk about being frustrated but they live forever. In any case, it's quite clear to me that one of your problems is to get more men into this field.

One of the factors that impressed me in your data is the extreme compression of the salary ranges. You begin at an adequate salary. It is not good, but it is getting better. A college graduate begins in your field at $6,000, but very few ever get over $7,500. This is simply not competitive for a male universe. A salary of $7,500 may be possible for a woman who comes into the labor market, stays a few years, goes out, comes back, and so on, but it is simply not sufficient for a man who has a family. In the restructuring of the field, assignments and career opportunities must justify paying people at the top at least $15,000. There must be a reasonable number of high-paying jobs.

Now let me tell you some of my own suggestions. I don't expect you to follow them; I'm not sure that if I talked to you tomorrow morning I would believe them. But you can pick and choose from among them.

Number One is that there must be better articulation between the young men who leave the armed services with training in medical technology and your own field. If you want men, you must take advantage of the male manpower who have some background interest and competence in your area. That means that you must look very carefully at too rigid educational qualifications for certifications and promotions. Or, you must build in an easier system for them to pick up their undergraduate degrees, if you insist upon them. If you want the men, which I suggest you must want, then you must either make it easier for a lot of these youngsters who do not have baccalaureate degrees to qualify without them or you must give them some time off to make it a little easier for them to pick up the academic work.

Number Two, I was distressed to find in your literature that you had decided that a certain subgroup should become Certified Laboratory Assistants. Now I have no objection to that, but it's roughly an $80 a week job. First, you can attract minority group members into an $80 a week job, and I submit that there must be some place for these people, white or colored, to go from this starting point. The problem of work is the problem of opportunity and prospects. In the medical service industry there is no ladder of opportunity. A nurse who graduates today gets the same amount of money as a nurse who graduated thirty years ago. That is an impossible structuring of a field. This exists in no other field except medicine. No field can be competitive with the rest of the economy unless there are meaningful career lines.

In a steel mill, a man who gets the lowest job in the outside yard has a chance to progress through 18 steps and nobody asks him what his education has been. His promotion depends on what he can demonstrate through performance on the job. Now not every one in the steel mill goes through the 18 steps but one with aptitude and motivation does. In contrast, the medical field is hobbling itself seriously by virtue of the fact that it is insensitive to the need for career progression. In former days there was no need for progression. There were simply those who cleaned the hospital, the nurses and the doctors. The only progression that took place was that nurses occasionally married physicians. That doesn't happen any more because boys come to medical school married, or they are married before they get into the hospital.

The third point refers to room at the top. I would like to suggest that there be a job in the laboratory known as Assistant Clinical Director (the language is unimportant) and that people are entitled to get into those slots on the basis of prior competence. These slots would pay a man a living wage which would be of the order of $15,000 to $18,000 for an assistant director of a good-sized lab. The pathologist should not necessarily keep ALL of the emoluments and fringes. It seems essential that some of them be shared because at the present time one of the reasons for inadequate laboratories is that too many pathologists are trying to run a business which is too big for them to supervise. This is another way of saying that it is not only that laboratory assistants or medical technologists are not well trained, but it is also that the well trained pathologist is too busy to manage effectively. There ought to be some way of defining competence and testing for competence in which people other than fully trained pathologists run the laboratory. Now, if this career line is to have meaning, the consumer's dollar must be shared. The medical manpower problems of the country will not be significantly improved unless some redistribution mechanisms are put to work. I asked some distinguished radiologists in New York what they paid their senior technicians. One paid them $185 a week and he thought this was tremendous. That technician may add $30,000 to the radiologist's income. There is no other area of the economy which is as antiquated as medicine and where little trickles come down from the physician to other people.

The next point has to do with whether you want and prefer more state or federal controls, because some kind of controls obviously have to come. For my physician in New York to play two laboratories, one off against the other, because he cannot trust either one, makes little sense in terms of a consumer's dollar. This concerns the money that Congress is appropriating and that the consumer is spending. There must be more controls; the question is, simply, what system of control makes sense.

At this point I'd like to call your attention to the Junior College movement, which in my opinion is the fastest growing dimension of higher education in the United States. The distribution of salaries paid to people in medical technology show practically no difference among individuals with no college degree, a junior college degree, and a college degree. In a certain way the market disciplines spurious differentiations. I strongly submit that if there are requirements in sciences for medical technology, they could be squeezed into the Junior College within the two years. It is nice for a medical technologist to know French literature, but it's not essential. I am asking what part of your educational requirement is real and what part is spurious or snobbish.

I continue to be the advisor on manpower to some of the military services, and I have watched a competition in snobbishness. The Navy has had the best cut of manpower historically: it was imitated by the Air Force and the Army pushed up in the rear. Each service kept raising its standards, much of them unrealistic. For your field the junior colleges look to be an important supplier of certain kinds of manpower.

I also suggest that you ought to ease your way into the baccalaureate pool. If you need people with training in microbiology or chemistry, it is important that you have a structure which makes it relatively easy to attract people from such a pool.

I'd like to make a suggestion about the women. Your literature is replete with evidence of the importance of getting people who are trained in medical technology back into the field. Twenty-five percent have disappeared from the field. The men undoubtedly have gone on to greener pastures. You might well expand the pool of returning college-trained women with undergraduate degrees in science. If these women have a chance to take a refresher course to pick up some additional training they may well be integrated into your work force. They are very good personnel, because by the time they reach "maturity" which is defined as any time after their youngest child is in elementary school, when the women are 32 or older, they are stable workers.

I'd like to make a radical suggestion which affects the whole of the medical field and yours in particular. I suggest a few scholarships for medical school for people who begin as medical technologists but who become attracted and excited about medicine in their late 20's. I'm not suggesting that scholarships be available for people in their fifties, but it's highly important in a democracy to give people a second chance at opportunities they did not have initially because they were too poor, which is the basic reason why some people don't go to medical school. The other reason is that earlier they were not so attracted to the field.

It would be nice if an organization such as yours were to give two or three competitive scholarships a year for medical school. And this would be a very attractive potential recruitment device. If one knew that he could go "the whole way up" if he were very good, he would be more tempted to enter the field. It's like the private who, in theory at least, can become Chief of Staff.

Next, as the new designs of American medicine and the organization of American medicine develop, one of the problems that this organization will have to work out is the conflict of interests between the affiliated groups within your organization.

I will end by saying that your group has done very well indeed to date. I see no insuperable problems facing you. If I had to distinguish among the areas of medical manpower, I would put you in the less worrisome. I don't mean that there are no problems. To get clinical laboratories properly staffed, properly supervised, properly managed, is a problem. But I think it can be done. The big challenge you face as an organization is to be aware of the fact that the whole of American medical care, the whole system, is now wide open. Everything is in movement. Technology is in movement, financing is in movement, hospital design and re-planning are in movement. The manpower streams are changing. The governmental control operations are changing.

The years 1965-1975 will represent a challenge to American medicine not unlike the decade after Dr. Flexner wrote his book. It is incumbent upon all leadership groups such as your own to make sure that you don't get stuck with the patterns that served you well in the past, but that you develop the flexibility to come out where it makes sense to come out a decade hence.

THE MEDICAL LABORATORY -- A LOOK INTO THE FUTURE

Ivan L. Bennett, Jr., M.D., Deputy Director
Office of Science and Technology, Executive Office of the President

When I was invited to give one of the so-called keynote speeches at this potentially important conference, I accepted promptly -- and for two very different reasons. The first is personal. I always welcome an opportunity or an excuse to hear Dr. Eli Ginzberg speak on any subject and when he discusses the subject of manpower, he speaks from a depth of experience and understanding that is unequalled.

His views are always refreshingly frank and appropriately provocative, and he has an uncanny ability to stimulate new ways of thinking about old problems.

My second reason for being here is the fact that the problems which those in attendance at the conference have been asked to examine are exceedingly important.

I referred earlier to this conference as "potentially" important because, from my past experience, which coincides with that of many other inveterate and incurable conference-goers, the mere fact that a conference concerns itself with an important subject does not guarantee that it will turn out to be an important conference. All too often, group discussions generate straight answers only to ephemeral questions and the really hard problems are avoided completely or are smothered by rhetoric, platitudes, pious utterances, expressions of conventional wisdom, demands for reality orientation, or a call for bold new looks at ancient and stubborn facts.

When I received a copy of the penultimate version of the program for this meeting, I was flattered to note that the planning committee seems to be under the impression that I possess the gift of prophecy. I do not, and I do not intend to regale you with a demonstration of that popular and definitely "in" pastime, technological forecasting.

It was Winston Churchill who said: "It is always wise to look ahead, but difficult to look further than you can see."

As is made abundantly clear in many of the background papers and abstracts in the Conference Resource Book, innovations in clinical laboratory instrumentation in recent years may be a mere foretaste of things to come. The technology and the engineering skills already in existence are quite sufficient to permit the development of far more sophisticated instruments than any of those now in use (a development that will take place, of course, only if there is an effective market demand for the instruments). Generally speaking, predictions about future technological developments, no matter how fantastic they may have sounded when first uttered, have fallen short of the fantastic reality that has come into being by the time the future has finally become the present.

In a very real sense, the whole function of this conference is to look at the future and, as acknowledged in a rather perfunctory fashion in a paper in the Resource Book (to which I will return later), a look at the future implies the selection of goals or purposes.

I have no intention of selecting the goals for this conference or of looking into the future for you. I will, however, give you some thoughts about how I believe you should go about establishing your goals and how you must go about looking at the future if the conclusions and recommendations resulting from your discussions are to be meaningful and are to address themselves to the solution of real problems.

In a word, I am going to tell you how I think you can best assure that this conference is an important one rather than merely another "happening."

Let me say, at this point, that I fully understand and appreciate the enormous expenditure of time and energy that has gone into planning and arranging for this conference. It is not my intention to derogate or belittle those whose hard work has made this conference possible. Indeed, my apparent impertinence or, as Dr. Ginzberg might call it, immodesty, is intended only to help make the product of their efforts as cogent and as useful as possible.

The objectives of the conference are stated clearly and unequivocally and I am in complete agreement with those mentioned by Dr. Fenninger which emphasize manpower, training, and utilization. I call attention particularly, however, to the main heading under which these objectives are listed: "...to explore appropriate actions to assure that the medical laboratory will more effectively serve America's health needs."

My concern is not with these stated purposes but with the implications of certain of the documents and articles that I find in my Conference Resource Book. Here, I find premonitory signs of a disorder for which I propose to prescribe preventive medication. My snap diagnosis of this incipient metabolic defect which obscures future vision is what Hasan Ozbekhan has called "the perpetual present" and F. L. Palak has referred to as "timeless time."

Ozbekhan described the disorder, which is, incidentally, quite common, as follows: "Today, the future tends always to be viewed, hence methodologically approached, as if it were the mere extension of the past... The future should be viewed as a solution to the present, not as an extension of it, and desirable ends should never be confused with the means that make them feasible."

What I am saying is that the key to looking at the future, as is true of any other field of intellectual inquiry, is to maintain a proper viewpoint or as A. N. Whitehead once put it: to seek simplicity and then to distrust it.

The principal danger in the selection of goals for the future lies in the powerful and diverting temptation to indulge in what I will call "self-fulfilling prophecies." These are particularly harmful if the prophecy points in a direction which does not conform with the best attainable goals.

The paper in your Conference Resource Book entitled "Factors Shaping the Future of Medical Laboratory Practice"* is an outstanding invitation to indulge in self-fulfilling prophecy. It well illustrates the truth of the statement by R. G. H. Siu: "The reason that the present century is fittingly called the machine age is not the abundance of machines, nor is it man's dependency on them. It lies in man's changed attitude.... Consequences are taking the place of purposes."

The paper describes the problems created by technological innovation and automation in clinical laboratories, particularly the economic problems which the transition from

* Reprinted in the Appendix to this report

traditional labor-intensive methods to capital-intensive enterprise is raising for practitioners of clinical pathology. That this should be of great concern to those members of the medical profession is quite understandable. I have no quarrel with their fully justified worries about the possible take-over of laboratory medicine by what the paper terms "conglomerate corporations otherwise unrelated to health care."

The paper does not address itself to the larger question of assuring that the medical laboratory will more effectively serve America's health needs.

The so-called "fundamental questions" posed in the paper: "To what extent is laboratory medicine to be subject to professional control and motivated by professional requirements?" and "Also to what extent are pathologists and medical technologists to become salaried employees of corporate subsidiaries?" -- are neither fundamental nor do they necessarily follow from the situation which is described. Most important, however, there is utterly nothing in either of them that should influence decisions about how the medical laboratory can more effectively serve America's health needs. They concern possible consequences not purposes.

The implication that for medical technologists to become salaried employees of industry (or, as it is called, corporate subsidiaries) is something to be avoided is worth examination. If the laboratory industry is as competitive as it is pictured to be and if technologists are in short supply, is it not just possible that the demand for their skills in industry might take care of the problem of income which appears to be an important factor in attracting individuals into the field? I can imagine worse situations than having corporate subsidiaries bidding for my services and skills.

The same paper goes on to state: "Change itself -- even drastic change -- is no doubt inevitable. Right now those who are guiding laboratory medicine are being confronted with the same problems that beset the independent grocery store owner a few decades ago. Just as machines that mass-produced groceries brought on chain store distribution, so machines that mass produce tests are leading to the corporate enterprise of laboratory medicine. But it might be argued that human lives are not exactly in the same category as groceries."

This, of course, is pure, unadulterated hogwash. The comparison is not between groceries and human lives; it is between groceries and laboratory tests. As important as laboratory tests may be for human life, they are not as necessary to life as is food. If chain stores make food of higher quality available to more people at lower prices, are they not fulfilling a worthy purpose? Was preservation of the independent grocery store owner (whose disappearance is a consequence, not a goal) something that our social system should have selected as a goal?

Consider, if you will, what mass production of pharmaceutical compounds has done to the compounding of medicines by pharmacists. Are chains of drugstores an evil? Should we return to the good old days when the pharmacist had to measure and mix the ingredients for each prescription?

Finally, the paper states that there will soon be a choice: "Whether clinical laboratories will be operated as an enterprise of large unrelated corporations or as a health resource to be allocated as broadly as possible by professional and public training groups. Will the primary objective in the laboratory healing arts (note that medical laboratories here have suddenly become laboratory healing arts) be maximization of business profits or of public contact?"

This, too, is hogwash. Obviously, someone is going to have to pay to have laboratory tests performed and whoever performs them will, quite rightly, expect to make a profit -- are "business" profits less desirable for the health of the American people than "professional" profits? The reference to "large unrelated corporations" as a clearly undesirable alternative is perhaps the most interesting bit of hogwash in the whole paper. Earlier, the Kaiser-Permanente multiphasic unit is mentioned in glowing terms.

The Kaiser-Permanente Health Plan is a wholly owned subsidiary of Kaiser Industries and its services are by no means limited to employees of Kaiser Industries. It is as much an "industry" as is the Kaiser Aluminum Company.

I hasten now to point out that I am not condemning everything in the Resource Book. In contrast to the inappropriate, inaccurate, and irrelevant statements which I have singled out (from an anonymous paper), I would point to the excellent summary of Automation in Clinical Laboratories by Drs. Kinney and Melville where the facts are set out in an orderly fashion without being interspersed with ponderous pronouncements of impending doom.

What I have been trying to tell you thus far about looking at the future is epitomized in the following statement by the late Dr. Norbert Wiener: "There is one quality more important than 'know-how'... This is 'know-what' by which we determine not only how to accomplish our purposes, but what our purposes are to be... Whether we trust our decisions to machines of metal, or to those machines of flesh and blood which are bureaus and vast laboratories and armies and corporations, we shall never receive the right answer to our questions unless we ask the right questions."

As you look at the future during these next two days, I hope that you will take the attitude that George Bernard Shaw claimed when he said: "Some men see things as they are and ask -- Why? I see things that have never been and ask -- Why not?"

Whatever your conclusions about the future may be, you can be sure that any suggestion for change will become the focus for all of the criticisms, all of the complaints, all of the warnings, and all of the parochial angers and frustrations that can be mustered.

As Machiavelli pointed out long ago in "The Prince": "There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things, because the innovation has for enemies all those who have done well under the old conditions and lukewarm defenders in those who may do well under the new."

During these next two days, I urge you to open your hearts and your minds, and that you consider nothing as a "given," insusceptible to change. I urge you to be tough but flexible, to put some resilient steel into your conclusions and recommendations. If you can follow the suggestions of Thomas S. Kuhn to substitute "evolution-toward-what-we-wish-to-know for evolution-from-what-we-do-know," many vexing problems may vanish in the process.

All of us, and I include myself, are in thrall to our own quasi-sacred beliefs.

All of us, and I include myself, indulge in self-serving rationalizations.

All of us, and I include myself, prefer to avoid direct confrontation with the hard demands of reality.

All of us, and I include myself, are, as John Gardner has said: "...skilled in identifying our vested interests with the Good, the True, and the Beautiful, so that an attack on them is by definition subversive."

All of us, and I include myself, are capable of putting aside what I will call these "human frailties" if the occasion demands it.

To look at the future meaningfully demands that they be put aside and to look at the future is at the heart of the success of this important conference. I hope I have accomplished my purpose here today, a purpose that was expressed by Jim Lonborg, the Boston pitching ace, a few days ago when in discussing his use of the "brush back" pitch against opposing batters, he said: "It is my intention to place an affirmation of doubt in their minds."

CHANGING PATTERNS IN EDUCATION

George A. Wolf, M.D., Provost and Dean
School of Medicine, University of Kansas

Speeches have repeatedly been made concerning the fact that the horse and buggy doctor is gone, that it takes more than four people to service one hospital bed, heaven knows how many people to meet health needs and still more people to meet demands for health care. Different voices have spoken to the need. For example, people want more doctors. Hospital administrators want more medical technologists and record librarians, doctors want more nurses, nurses want more nurses but not the kind the doctors want. In addition to the above the health professionals have continued not only to multiply but also to divide. They have multiplied by developing the new areas of geneticists, inhalation therapists and others, and divided by creating medical record library assistants and pediatric cardiologists. In short, the whole thing is quite a mess.

A review of the federal legislation related to education over the past 105 years reveals words such as "agriculture and the mechanic arts," "vocational education," "vocational rehabilitation," "Cancer fellowships," "defense education," "mental retardation," "health professions education assistance," and etc. Secondly, enrollments in institutions of higher education per hundred persons from 18 to 21 have almost doubled in ten years. About two times as many of these are enrolled in public schools as in private schools whereas as recently as 17 years ago, they were equally distributed among public and private schools. These data can be interpreted to mean that the public has recognized the need for educated and trained people. The nature of the federal legislation for education passed so far has provided funds hopefully to meet the needs of the American public and has recognized the need in some areas more than others, especially the health professions. Fortunately the legislation has put the monkey on the back of the local institutions and non-governmental accrediting agencies. This freedom to do the job our own way is precious but can be lost if we do not produce the trained people the public expects. Failure to do the job locally can result in the loss of freedom.

This means we must shift the focus from ourselves as individual professional groups. We cannot have as our primary concern the welfare of our own professional groups and expect to accomplish the above objectives. In any event we cannot accept federal (public) money if we do not intend to strive to meet the public need. If we do accept this money and do not meet the needs, we are asking for interference with our local operations from a central source -- the provider of the money.

As workers in the health field, we must shift our attention from ourselves to the health needs and educational needs of the people. In so doing we have a better chance by combining our respective talents and avoiding duplication of effort. In a period of acute manpower shortage the fight over who does what for a patient is as ridiculous as is duplication of effort. A collective look at health needs of people might change our daily activities dramatically in the future. Alas, some of us are such creatures of habit that such changes would make us acutely uncomfortable. This brings up students who are not such creatures of habit and who will be doing the job long after we are gone, and hopefully better.

Recruitment. Recruitment should be carried on conjointly. It is very confusing to the inexperienced student to be brainwashed by several representatives of the various health professions separately. They do not understand the fine distinctions among the work of the various groups. Recruitment should be an exposition of the roles which the various workers play in caring for the patient, leaving the student to decide which role he wants to play. Recruitment must be an educational function and not a sales job, in my opinion.

Opportunity. In developing our educational system in the health field, we should avoid vocational cul-de-sacs. Students should be free to progress upward on the educational ladder or stop at a given point and be able to lead a productive life. We make it difficult also for students once out of a program and embarked upon a career to return and move higher on the educational ladder. There must be a core health educational curriculum which will not ignore liberal education for its own sake, and yet will provide the sound base from which the student can step into advanced educational programs for one of the health professions. Here again conjoint planning for the needs of students in the health field rather than planning separately for the greater glory of each of our own fields is the way to approach this.

Teaching. Repetition and practice is an effective way of teaching certain skills, yet hopefully we are teaching more than just skills. In addition, substantive information and attitudes must be learned by the students. With the limited time available to us, we must be sure that repetitive work in the laboratories or at the bedside not only contributes to skills but to the other two goals. Indeed an educational environment which teaches the student his role in the total operation of health care might be better than a restrictive environment concerned only with the precise learning of several techniques. Although the teaching hospital sometimes is not the best environment for young pre-baccalaureate students, a variety of arrangements should be explored to permit the student to learn about the function of other members of the health team in their natural setting. It is important, however, that the educational experience gained in a hospital with teaching programs be under the close supervision of educators. The experience there must be educationally sound and relate meaningfully to the curriculum which the student experiences over a period of time. For the educational people simply to farm the student out to a service laboratory where the workers have no time to teach and without educational supervision is inefficient and poor from an educational standpoint. Moreover, if our objectives in teaching are the development of skills, the transmission of substantive information and the creation of attitudes, one teaching technique is not the method of achieving these three diverse goals. Performance in a laboratory or at the bedside under the close supervision of those who are qualified, interested, and paid to teach, can assist the learning of skills. But have we exploited the use of self-teaching devices to bring elementary knowledge up to a level where the laboratory and a skilled supervisor-teacher are needed? Which end of a pipette to draw upon is hardly a skill to be transmitted by a teacher. Substantive information can also be learned from books, film strips, teaching machines, closed-circuit TV and so forth. Is it really necessary for teachers to mouth what has already been put into print? Attitudes are another matter. How to sterilize a syringe is different from making sure the syringe is sterilized before it is used on a patient. These simple attitudes and the more sophisticated ones can only be taught by close contact with a competent instructor. Possibly our valuable people in this category should have their energies conserved by the use of the other methods of achieving our other teaching objectives.

We are all aware that a great ferment exists among health professional groups. The desire to get together in the health field is being expressed by such organizations as the Association of American Medical Colleges, the American Medical Association, the University Programs in Hospital Administration. Reports such as the Coggeshall and Millis documents speak to togetherness. Liaison of professional societies will not occur until the professions themselves realize we are obliged to do something for patients and we are training our students to do something for patients. Now, through the Congress, the patient or the consumer has a voice, and they are speaking loudly and clearly.

In conclusion, I am suggesting that people have obvious health needs and clearly expressed demands. They want their children to have educational opportunities, and they also want a pool of educated people to take care of their health needs. Private education was based on the concept that we will select a few, teach what we think they should know, and eventually they will become "the leaders." The legislation passed in the past century emphasizes the concept of relevance of education along with educational opportunity for youth. The people, of course, want their children to be "leaders" but they also want educated people to do things for them. Thus, a new dimension has been added and we in education must deal with it. Changing educational patterns are not necessarily new techniques of education, but better application of existing techniques. There are no new, easy gimmicks to help us. We must revise our educational objectives and take a fresh look at how to achieve them.

We have been thinking the more health professionals we educate the more money we need, and the more such people we can produce for the least expenditure, the more efficient we are. On the contrary, efficiency in our field is collectively addressing ourselves to the educational needs of young people and the health needs of the nation.

As the man said to the pigeon: "Let's go down to the park and feed the people."

HEALTH LEGISLATION AS IT AFFECTS MEDICAL LABORATORY MANPOWER

Honorable Paul G. Rogers, Congressman from Florida

Thank you for the opportunity to speak with you here tonight. Considering the makeup of the audience, I am doubly pleased.

For, in essence, you have, in attending this meeting, cut across the lines which usually keep the many facets of health and medicine apart.

I do not have to tell you that the majority of meetings you will attend in a year are concerned mainly with your specialty -- be that hospital administration, clinical research, microbiology, and so on. These meetings are necessary, but meetings such as this one tonight, where men and women of medicine, from all areas of the spectrum, gather and discuss common problems, are less usual and immensely valuable.

Medicine and the administration of medical services are inter-dependent. What affects the price of a hospital room will eventually be related to the practicing physician. A breakthrough in an area of cardio-vascular surgery will eventually be related to the technician in the laboratory who runs the tests.

I commend you for this meeting. I sincerely hope there will be other such meetings where men of different disciplines will meet to discuss the problems common to the entire spectrum of the profession.

Tonight, I hope to explain what we in Congress are trying to do to help eliminate one of the major problems facing our country -- the severe lack of manpower throughout the profession and especially in the medical laboratory.

Before I go further, I want to make one point. We in Congress are aware of the needs of medicine and the huge gap in manpower and are working to help solve this problem. But we need your advice and expertise.

The number of people needing medical assistance, as you will know, is increasing beyond the normal population increase. There are more people, and these people, because of our advancing technology, are living longer. This has led in part to the development of the Medicare program. This in turn has meant that more people are examined and need treatment. This, of course, only amplifies the manpower problem.

Our aging population is plagued mainly with chronic illnesses which require detailed examination which leads to prolonged investigation in the physician's office and along the chain right down to the technician who processes the information from the examination.

The manpower gap is thus pushed wider and wider.

A dozen years ago the National Committee for Careers in Medical Technology, sponsors of the conference here, conducted a study in time on chronic illnesses.

The survey revealed that 40 different laboratory tests were used on cancer patients an average of 22.5 per patient, which took a total of 9 hours and 33 minutes to perform. The average cardio-vascular patient required 19.6 tests which took an average of 7 hours and 59 minutes or 8 hours. This points to the detailed work which is required and the time involved.

In the past decade these figures have changed as new tests and procedures have been introduced Many of them are the result of this nation's vast medical research program which started with the National Cancer Institute Act of 1937, which paved the way for the National Institutes of Health.

While there is an admitted shortage of physicians -- this has been well publicized -- there is also, and I consider this of like importance, a severe shortage of supporting manpower.

The shortage of physicians is vividly pointed out when you consider that almost as many foreign doctors entered the United States last year as the United States universities graduated. According to federal figures, about 7,500 foreign medical graduates entered the United States last year, while American medical schools graduated 7,574. A problem here is that it is estimated that half of those foreign graduates never pass U.S. medical tests, yet practice in some way because of the severe shortage.

As you know, many technicians are required to do the laboratory work for one doctor's diagnosis and treatment. And this is vitally important work.

The pathology laboratory has been called the "bridge" between scientific research and clinical medicine. For here is where the new tests and procedures are usually applied. I think most of you would agree that the scientific and technological developments of the past few years have produced as many problems for medical laboratory personnel as have the increases in numbers of tests to be done.

So we have a problem of three dimensions -- producing more manpower to fill the already existing manpower gap, establishing a program for increasing this number as technology requires more manpower, and developing a system of retraining those we have to match the ever changing technology of the laboratory and medicine.

This means searching out all possible sources of manpower from the most basic level by encouraging young people to enter the profession; formulating a program which will allow those interested to pursue an education through financial help, both to the individual and the educational facility, and retraining those now in the profession so that they are constantly working at their optimum level of ability.

Last year I was the chairman of a special subcommittee charged with investigating the Department of Health, Education, and Welfare with primary interest in the Department of Health.

Among the recommendations made in the report was one for a continuing program of evaluation of the use of manpower and retraining for new health occupations. At the time we felt that much of our limited supply of manpower could be put to better use.

We noted the importance of allocating work functions for maximal output on the basis of training and experience, and the need for continuing and graduate education programs. Among other things we pointed out the need for more instruction and instructors. And of course we pointed out the need for a continuous evaluation of the use of manpower and retraining for new health occupations.

I think the single most important piece of legislation aimed at alleviating the shortage of manpower to come out of the Congress in the past ten years was the Allied Health Professions Personnel Training Act of 1966. This extended the financial assistance for construction of teaching facilities, educational improvement grants, development grants and traineeships for advanced training. It has also increased the loan forgiveness for physicians, dentists, and optometrists who practice in poor rural areas.

At that time the point was made that the shortage in allied health professions would run approximately three times behind the need by 1975, unless we started graduating more than we are at our present rate. In the seven selected areas of health, the graduates in 1965 were estimated at 10,400, while the need forecast for 1975 was set at 47,000 per year.

The first Allied Health Bill was passed in 1963. The bill passed last year was designed to promote new programs of support for the education of a wide range of professional and technical personnel in the allied health occupations, to meet the growing and increasing urgent needs for such personnel. The need was obvious.

In 1964, the last year for which official reports from the schools were available, there were some 6,369 graduated at the baccalaureate level and about 1,721 more at the advanced degree levels in medical technology, x-ray technology, physical and occupational therapy, dental hygiene, and other health professions.

On the basis of information received from professional organizations in these fields, we estimated that there was only a slight increase in the last two academic years. Under the 1966 three-year program, training capacity for these and similar groups might be increased by 3,000 to 4,000 depending on the size of the appropriation and the speed with which the schools are able to respond to the stimulus.

I cannot say that the bill was overly funded. But I am encouraged that we have a start. We have included junior colleges to encourage the paramedical arts. I might also add that the funds established last year are apparently being used in an effective manner.

I think it will be of interest to you to know that of the 192 institutions that received basic improvement grants under this act for undergraduate courses in the health professions, 146 included courses for medical laboratory personnel.

And of the 27 advanced traineeship grants given to colleges, universities and medical schools for graduate courses, 19 were for medical technologists and five were for scientific subjects related to medical technology.

This year the major health legislation we have taken action on is the Partnership for Health Act, which also deals subtly with manpower by establishing a National Advisory Council on Education for Health Professions. This will be composed of a 17-man board reflecting all facets of the profession. Its job will be briefly to study all facets of the profession including education and training, which will, I believe, help in the long-term and short-term goals of stimulating manpower.

I think each and every one of you should concern yourself with the Partnership for Health Act, as it will directly effect each and every one of you in some manner through the realignment and condensation of health planning.

I think it important that we give another item some consideration. In every field and every profession automation has been recruited to help. In each field imagination has been used to develop mechanical means to eliminate burdens placed on highly trained men who are forced to do routine and time consuming tasks.

In most present industries the initiation of computers and other forms of automation means replacing men with machines. But, in the health industry, we do not have a surplus of manpower, and automation -- if it can be applied -- would alleviate a portion of our problem. I think it important that we start thinking about a more expanded use of these methods and materials in medicine. This would free much of the scarce manpower and allow those coming into the professions to start at a level where we would realize their maximum talents.

You know, of course, this is not unrealistic. Last week I read where computers may soon be used in diagnostic treatment.

But back to today. The most essential item now is proper planning. Planning with imagination which will be realistic over a period of time. And this is where your talents can help.

We in the Congress need help in detailing those problems and suggestions for possible solutions.

This information is essential if we are to emphasize properly the needed areas and judiciously allocate the limited funds we have available.

Therefore, in closing, I hope that we in the Congress may hear from each of your specialties in the medical field with concrete suggestions.

The people of America expect the best possible medical treatment available. And they deserve it.

If we fail in this area of manpower, there is no way possible that either of us can truly live up to our responsibility of insuring the American public that the best medical care available will be theirs.

SYMPOSIUM

On Major Medical Laboratory Manpower Issues
(Selected Excerpts)

EDUCATION -- Calvin Plimpton, M.D., President, Amherst College
(Also served as Moderator)

Science is moving along. If you have only trained somebody, you have probably only trained them to do something one way or to execute one procedure but with changes this training may suddenly become irrelevant. If on the other hand you have trained them to think, if you have really provided them with an education, then the man or woman can move from one procedure to another and even from one profession to another. As an example, if somebody is trained as a medical technologist and is familiar with the operation of microscopes, blood counting chambers and bottles of urine, he may well be left out in the cold if you introduce new procedures, new techniques, with which he is not familiar and the principles of which he cannot comprehend. If, however, he has been educated, he has acquired certain patterns of thought, certain ways of approaching things, certain ways of establishing qualitative judgments and, therefore, has the background to live with change and himself encourage improvement.

The essence of a continuing education is the essence of helping people to grow and if they're continuing to grow, they are also continuing to stay young. There are many people who are able to suck oxygen in and put carbon dioxide out but who are still walking around like zombies and are absolutely dead. This is because they have stopped learning somewhere along the line. As opposed to that, there are a group of people who are almost eternally young. If you visit an old folks home, the one person you never seem to find there is an old teacher. This is because they are up at the headwaters of the Amazon, they are in Katmandu, they are in the souks of Damascus, they are, in short, out exploring, out learning, out acquiring new opinions, new attitudes and new knowledge. Somewhere along the line these teachers, perhaps because of their contact with young people, have become accustomed to continually learning, continually going ahead and, therefore, remaining continually young. One cannot be too didactic about this attitude but I think it is associated with a spirit of curiosity. It is important that the institution has this attitude of curiosity. I believe it is typical of the attitude of good physicians, good nurses, good technologists, and I am sure it is this attitude which will be most responsible for progress in the future. Somehow it does indeed arise from education and occasionally it can be stifled when people receive only training. Hence, I am making a plea for education not just about a particular subject but education for life as well.

CLINICAL PATHOLOGY -- E. R. Jennings, M.D., Director of Pathology,
Memorial Hospital of Long Beach, California

Not all of our problems will be solved with automation. In the small laboratories, we have the greatest need for the most competent, well-versed and general medical technologists. In intensive medical care units, the laboratory may be moved to the bedside with the medical technologist in attendance 24 hours a day.

We also must distinguish between the care of the sick and the injured and their needs, and the problems of preventive medical care or the detection of latent disease in a population that is apparently well.

Automation will create a need for medical technologists to be teachers and supervisors, to be better trained, to trouble-shoot complex equipment. Many of the medical technologists I have seen and trained over the last 20 years don't seem to have the potential to fit into the new situations. I think that their jobs are going to be down-graded if others less well-educated are capable of doing the work that they are doing. Some of them are going to have trouble.

Licensing in California generally has been a very good influence on laboratory medicine. On the other hand, we've established a certain amount of rigidity. At times the California law has been a detriment to me and to the people of Long Beach, because people with very special skills who could not qualify under the law have been kept out of the state. We must take a fresh look at these requirements if we're going to be able to fit into what I think is an emerging pattern of laboratory workers in this country.

Wherever we have a profession with a compensation structure which is rigid, between $6,000 and $7,500 for the vast majority, where there is no place to go at the top, recruitment of talented individuals will be difficult.

MEDICAL TECHNOLOGY -- Leanor Haley, Ph.D., MT(ASCP), Director, Microbiology Department,
State University Hospital, Brooklyn, New York

I am convinced that the present baccalaureate degree for the medical technologist is a poor degree. It is really in all honesty not an academic degree and it is rarely recognized by any graduate school of a reputable standing. And I think because it is a poor degree is one of the reasons that we lose people in the field, because many of the programs as they are now set up do not stimulate students, offer no challenge.

We end up in many instances with rote workers from these programs. There's no doubt in my mind that the rote worker cannot do the work that we are going to have to do in the laboratory.

I do believe that some of the problems that we have in these programs may be solved with the establishment of the Colleges of Allied Health Professions. Here we have a whole new approach to the training of the medical technologist. We get them earlier, we can set up a whole new curriculum, and I'm confident that the Board of Schools and other people in this area of education will be very interested in setting up new experimental programs because in my opinion we cannot continue with the philosophy that now exists in the setting up of a school program in medical technology.

At the present time, the majority of us have to leave the profession to get our top supervisors and our top instructors, because the medical technologist does not come to us with a strong enough background to set up many of the new procedures and carry out many of the teaching and supervisory responsibilities that exist in the laboratory.

CLINICAL CHEMISTRY -- Ralph E. Thiers, Ph.D., Director of Clinical Chemistry,
Duke University Medical Center

The clinical laboratory field divides itself into two distinct parts. One of these involves quantitative measurements by methods which are objective. In the other part, judgment is required and the presence or absence of a given finding can be a matter of educated opinion. It is important for us to realize that the tremendous advances which had impressed us all so much in the last decade have been almost wholly in the quantitative part. This statement does not downgrade the importance of these advances. I would guess that between 60 and 70 percent of the work in the clinical laboratory is quantitative in nature. Automation has been a godsend. But the inroads of automation on the subjective part of the work of the clinical laboratory, where experience in pattern recognition is important, are quite unimpressive. On the other hand, it is the latter part which is most interesting and exciting to those who currently enlist for training in medical technology, and which we emphasize in recruiting and training.

Our present training programs therefore tend to address themselves to a situation which exists only as a minor part of the actual utilization of manpower. The people who put samples on the AutoAnalyzer don't need the amount or kind of training we give medical technologists, and the medical technologists don't get the kind of training needed to supervise those who put the samples on. The former is a very routine job which requires relatively little training. The latter is a very technical job best performed by a chemist or other scientist trained by universities and colleges. However, these scientists are almost wholly unaware that they are needed in the clinical laboratory, or if they are aware most of them have a strong feeling that they are unwelcome, or will be exploited.

We have talked about central and regional laboratories as being a future trend. Such laboratories have proved best suited to the quantitative part of the overall job. If this type of laboratory does increase in its relative importance it will siphon off more technologists into the quantitative areas and thereby create an even more acute shortage of technologists for the qualitative portion.

Therefore, I believe that the most efficient thing we could do to ease the manpower shortage and to make training programs better match the needs in the field would be to provide medical technologists with the higher grade of training in the areas of laboratory medicine which require judgment, and a decreased amount of training in the quantitative portion of the work. Along with this we must enlist the aid of schools which train quantitative-minded analysts in departments of chemistry and physics. Perhaps most important of all we must make these people feel welcome in the field and must work with them as colleagues. Scientists can properly supervise work of relatively untrained personnel who obtain data with automatic equipment. By concentrating the training of medical technologists on the subjective portion of the work the field can be thus covered more effectively.

We must realize that scientists should not be recruited by trying to interest them in patient-related activities. Unlike most of us they are not interested in such activities for their own sake. They are interested in improving the analytical results from quantitative instruments and methods. Their labors can result only in more time for those who are interested in patient care to attack the patient's problems or to train to attack them.

Unless we see this situation clearly we're missing one of the surest approaches to the solution of the problems of manpower in the medical laboratory.

HOSPITAL ADMINISTRATION -- Montague Brown, Director, Hospital Research Educational Trust of New Jersey, Princeton, New Jersey

In regard to Dr. Ginzberg's talking about togetherness, I'm not so sure that a company union will do good in the long run. I have a feeling that the technologists are in a company union situation. The technologist's interest will not always coincide with the pathologist's, and technologists should be considering their own interest somewhat independently.

There are some $18,000 a year jobs now, but there's another profession moving in. The hospital administrators are becoming assistant or associate directors of laboratories for the management side, and it looks as if the technologists might stay where they are and not be able to move into these higher paying positions. Some technologists should be pursuing degrees in management to fill these new roles.

Another possibility which we see in the not distant future is the development of large-scale organizations for laboratory work as well as for other types of services which are delivered in the community hospitals.

As was mentioned, we have to concern ourselves also with the rural areas where a highly qualified person is needed. I think we might find a supply of manpower for the rural areas in those people who would like to run a country-store operation. But in the metropolitan areas we are going to change, not because everybody wants it, but because I see money coming in the direction of buying the kinds of changes that have been discussed this morning, and I think that if you put your money on the barrelhead for this type of operation, you'll get it. I think people and organizations will follow the money and we'll get the new laboratories.

Some curriculums being developed look as though we are going to have people coming out of two-year schools who are much better equipped to function in the laboratories than are the people with the bachelor's degrees and with experience on the job of many years. Some people coming out of the CLA programs move to almost the same level as the bachelor's degree person in terms of functioning and in terms of salary. But they do not have the official paper recognition which might allow them to achieve some mobility.

A lot of Negroes are being welcomed into our lowest level jobs, the CLA program, telling them this is a great opportunity. Is it? Or are we giving them an opportunity to get boxed in? Employers are using these people. They are making a contribution. On the other hand, of all the citizens in our country, they are the ones who can least afford to be boxed in in this manner. They are least likely to be able to get back into school and go up a career ladder outside the job structure. I personally would welcome some more pressures to correct these problems in our institutions.

HEALTH PLANNER -- Stanley Olson, M.D., Director, Tennessee Mid-South Regional Medical Program

I hear one community after another say there is a shortage of technologists and those, who are already trained, require further training. New developments are taking place at a rapid rate and most of them require further training of technologists for their implementation. Many hospitals are not qualified to provide the kind of training needed; and the educational institutions, which are qualified, are not responding as rapidly as they should. The physician in the community says there are many things he cannot do because the laboratory procedures required to make the new diagnostic or treatment activities available are not performed in his hospital. The hospital administrator, in turn, points out that he has problems in recruiting the skilled technologists who can do these procedures, and beyond that the equipment required costs more money than he can allocate from an already tight budget.

Then the question directed to me is this: "How does the Regional Medical Program enter into this situation to exert a constructive effect?" I'm not entirely sure how far we can go in alleviating these readily identifiable needs because the policies of the Division of Regional Medical Programs are not yet sufficiently established so that we can, at the regional level, be certain that our efforts to increase the number of technologists will come within the purview of the national program. We recognize that we are at the beginning of a very new effort in our country in the implementation of Regional Medical Programs.

The primary emphasis of Regional Medical Programs is on improving patient care. Our methodology is research and education. The focus of the program is on categorical illness -- heart disease, cancer and stroke. The philosophy is the promotion of cooperation between educational institutions and those persons and agencies engaged in providing care. We are attempting to find out what the physicians need and what the educational institutions can provide, and further, how we can bring these two together. The requirement to prevent the program from becoming a medical "boondoggle" is that we must evaluate all projects to determine whether in fact patient care has been improved.

Hospitals will have to become educational institutions -- not to provide courses that can be given more effectively at the university or junior college level -- but to train the people on the job. The alternative is to force them to go elsewhere for their education and then to hire them back again at a higher salary.

PHYSICIAN USER OF LABORATORY SERVICES -- Bland Cannon, M.D., Member, AMA Council on Medical Education and its Committee on Allied Health Professions and Services

Physician users of laboratory services want our information instantly. We want accuracy -- which implies competent personnel, which may imply continuing education, reassessment, reevaluation, recertification. The system of health care has been far less reactive to external stimuli than any industry. We have been able to develop new systems and new technological advances, but we have been slow to spread them around and use them as they should have been used.

A change has started through automation procedures and multiphasic screening. Perhaps we as physicians must approach the patient from the objective side, not the passive side, where there is a screening mechanism whereby we can start on a baseline, assuming that these things about your physiology are normal, and then progress into the symptomology. It is you, through multiple laboratory screening, who probably can advance this technique.

When you're planning, one must plan as in TV communications. Flexner did a job of still photography planning. He took a picture of what it was and he wrote out what it should be, quality. He failed to perceive the movement. If he had picked up a movie approach, he would have seen a changing scene and he would have noted that continual planning is necessary. But this is too slow now. The change in planning has to be instantaneous.

COMMUNITY USER OF LABORATORY SERVICES -- George James, M.D., Dean, Mount Sinai School of Medicine, New York City

The need in the community is not determined by what the professional society says or by what the people demand. You must be even more concerned with what people need than what they are at the moment asking for. Practically every disease of any significance that has ever been controlled has been attacked before it became symptomatic, usually before it even occurred as a pathological entity, by attacking it during the risk stage. Chest surgeons are capable of saving only about 1 in 20 patients with lung cancer, so they border on being irrelevant to the control of lung cancer. By the same token if seventh grade school teachers could come up with a means of preventing children from starting the cigarette habit, they would be infinitely more effective.

If you start with needs, if you forget your professionalism, if you forget the way medicine is done now, the way people demand medical care now, and if you realize that our major hope for the future is to pick up many of these conditions when they are still at the risk stage or when they are in the early pre-symptomatic stage, you will see that there is much work in your future in gearing your services to meet these needs, both in the research and in the service ends.

People who are concerned with meeting the needs of the community at the local level are appalled at the lack of interest in quality care today. All of the evidence that is coming out of legislation in Washington seems to be emphasizing quantity far more than quality. This is something that has got to concern people more. The tests of quality are extremely important. People haven't yet begun to demand it, but they will and we as professionals, no matter what your field, have got to gear up to meet it.

High status and salary don't necessarily relate to our activity and effectiveness. When you get down to the contribution, the man who can cut with the knife can often do the least in terms of the total contribution for the control of illness. If we use control of illness as the parameter, I think we will see the allied health professionals become increasingly important in the future.

(Note: Since the members of the Symposium presented their remarks extemporaneously, they were given opportunity to edit and clarify the abstracts presented here.)

DISCUSSION GROUP REPORTS

Group I:	"Needs and Potential Sources for Laboratory Personnel"
Group II:	"Impact of Automation and Other Advances in Technology and Science on Medical Laboratory Personnel"
Group III:	"The Role of Continuing Education in Keeping Laboratory Workers Up to Date"
Group IV:	"Providing Career Mobility Through Education and/or Equivalent Laboratory Experience"
Group V:	"Certification and Licensure of Medical Laboratory Personnel and Accreditation of Schools"
Group VI:	"The Effects of Central, Regional and Other Emerging Laboratory Structure Patterns on Education, Training and Utilization of Medical Laboratory Personnel"
Group VII:	"Strengthening the Education and Training of Laboratory Personnel"
Group VIII:	"The Influence of Sociological and Economic Factors in Choosing Medical Laboratory Careers"

Note: The individual topics assigned to the Discussion Groups are noted above. Since all subjects relate to the central issue of "Manpower for the Medical Laboratory," discussions crossed border lines. Consequently, the following Proceedings are presented under topical questions rather than by group assignment. The material is based on the reports given at conclusion of the Conference as well as the records of the discussion group proceedings.

What categories and numbers of personnel will be required in the variously patterned medical laboratories of five, ten and more years from now -- what knowledge and skills the staffs will need to fill their roles effectively -- what steps can be taken now and in the future to assure that clinical laboratories deliver the services essential to the nation's health -- these were the questions to which eight discussion groups directed their attention.

In the course of the deliberations, it became evident that there was a basic need for a complete, detailed analysis of personnel requirements for operation of a modern, clinical laboratory in terms of the functions performed and the technical and professional skills required to perform them. Projected into the future, such information would provide a base for substantive programs of action on educational objectives, training mechanisms, career advancement, and recruitment.

Discussion Group I, examining the needs and sources of laboratory personnel, felt that more knowledge of present staffing patterns and skill and educational requirements was necessary to estimate accurately future needs and sources of personnel.

Group II, studying the impact of automation and technological advance on laboratory personnel, stated that such an objective basis was necessary in order to estimate effects of automation and computers on the number and types of personnel needed.

Group IV, discussing mobility through equivalency, concluded that levels and categories of laboratory personnel and the academic backgrounds and skills required were a necessary starting point for developing instruments and policies to equate experience and education.

Group V, on certification and licensure, felt that job descriptions were paramount to the establishment of standards for certification and licensure.

Group VII, in evaluating effects of technologic advances on education, found a definition of roles in the medical laboratory and analyses of skills and judgment required for each, basic to decisions as to what education and training are needed.

The other groups also mentioned need of such an over-all synthesis. Group VI, considering the effects of centralized and regional laboratories, observed that a job and skill inventory was needed to decide on personnel requirements related to different stages of automation. In its discussion on continuing education, Group III thought a survey of today's laboratory personnel would be helpful in determining how they can adapt to technological changes. Group VIII, reviewing effective recruitment techniques, felt that staffing plans describing laboratory jobs and their educational requirements were needed to clarify career opportunities for potential recruits.

It was recommended that the job descriptions be drawn up by occupational analysts, probably with the participation of other disciplines such as computer and data processing experts, system engineers, educators, and hospital planners. Group VII proposed participation by medical technologists, pathologists, and other laboratorians, and possibly other professions and also the public. No specific recommendations were made on the mechanisms of developing or the format of the recommended staffing study and analysis.

What Will Tomorrow's Laboratories Be Like?

While laboratories today almost universally use some automated instruments, automation was viewed by many as still in the experimental stage with big changes still to come. Development and adaptation of automation will come first in the large regional centers which have the necessary resources, volume of clinical specimens, and staff to facilitate invention and evaluation of new equipment.

Up to now, there has been more concern with machines that do tests rapidly than with machines that do tests well. The computer will continue to do an important job sorting data and providing access to it, but it must be used for more interpretive judgmental tasks. This is an area receiving relatively little attention now that represents a major hope for the future.

Automation will have the most impact in the large hospitals of 600 beds or more where the greatest number of personnel will be employed. Those who are highly trained may need to shift their orientation, but they can be expected to adapt to the use of automated instruments just as they have to the use of previous laboratory equipment.

The direct consequence of automation and of advances in transmission and storage of data will be the centralization of laboratories as the pattern of the future. Centralized laboratories will be concerned principally with large-volume routine testing for a number of medical facilities within a community. In addition, there will be regional laboratories, part of a larger medical complex such as a regional medical program, and reference laboratories geared to highly specialized tests. All of these will tend to be large, and some may function in more than one category.

Small sized laboratories -- in community hospitals or independent facilities -- will provide emergency and selected services, and will be at least partly automated. There will be bedside monitoring systems to provide constant watch on electrolytes, blood gases, drugs, and a number of other measurements.

Laboratories will vary in ownership and purpose. In addition to privately owned and hospital laboratories, and university laboratories devoted primarily to teaching, research and service, there will be centralized group practice and industrial multifunctional laboratories as well as federal, state and local public health laboratories.

Medicare and other prepaid health plans, group practice, multi-phasic screening and other preventive programs, will all add changes to the structure of medical care and laboratory service. Thealready evident impact of government and private insurance plans will become more pronounced, with greatly increased demand for larger numbers and many more types of tests. This can be expected to increase the need for more highly trained technical workers. At the same time, greater demands will mean potentially increased income to the laboratories, enabling them to increase salaries, especially at the top levels. This could attract more men to the field.

Opinion differed on the degree of automation to be expected in small sized laboratories, as well as on acceptance by the medical profession of centralized laboratory facilities. How these questions are resolved will affect the need for general-duty personnel to serve in community and rural hospitals. Regardless of emergence of centralized and regional laboratories, it was felt that a sizeable amount of laboratory service will continue to be given in the average community hospitals of 150-300 beds, as well as in the many hospitals with less than 100 beds that have increased in number in the past 15 years. They must depend on their own laboratories for emergency and "stat" procedures, blood banking, immediate hematology and urinalysis, and other tests. There was considerable debate on how to provide staff and supervision for these installations.

One suggestion was that qualified local residents such as older women or retired military personnel might be trained locally in limited procedures to meet specific needs. Such personnel would offer the advantage of geographic stability with a resultant reduced turn-over in laboratory staff.

An overall need to develop uniform systems of measuring output and productivity, so that workloads can be recorded and compared, was noted. Reference was made in one group to the system for federal laboratories developed by the Interagency Committee on Laboratory Medicine. As a promising approach, another group strongly recommended forming a task force under the auspices of professional organizations involved to develop a uniform laboratory reporting system, to be adopted throughout the country.

Who Will Work in the Medical Laboratory?

Individuals with specialized education and a high degree of competence will be needed increasingly to staff the top technical positions in the centralized and regional laboratories. Those qualified to fill these roles will need the breadth of basic science background to integrate and supervise the laboratory, knowledge of the mechanics of automation as well as of the basic scientific principles underlying automated instruments, ability to use maintenance schedules and quality control systems in automated methods, and sensitivity to sources of error in automated procedures. Included in this category would be persons with post-baccalaureate education and training in immunology, biochemistry, hematology, genetics, microbiology and related fields. Also at top levels of responsibility would be the teaching supervisors, probably with graduate degrees in education, to direct instruction at all levels of learning, including in-service and continuing education programs.

The place of the generalist was not as clear. One discussion group felt that all the baccalaureate medical technologists who can foreseeably be educated would be needed, as the laboratory personnel most adaptable to changing methodologies and instrumentation. This group foresaw needs for the generalist in large laboratories; in academic programs in supervision, education and administration; to staff small to medium sized laboratories. Other discussants agreed there would be a place for the generalist, but felt it would be mainly in small laboratories. The reluctance of technologists trained in large universities and medical centers to go to small community and rural hospitals was discussed, as was the advisability of some kind of general-duty technologist specifically for practice in small laboratories. Such positions might be at the junior college level and it was recognized that problems would arise in assuring standards of proficiency where supervision may be minimal or non-existent.

In much of the discussion, there was agreement that the medical technologist must go higher, not just in science but in total background and ability, to cope with change.

There was also fairly general concurrence that a number of new categories were developing in the laboratory and that new or modified curricula and training systems should be developed. Examples cited were biomedical equipment technology, already the subject of pilot curriculum studies, and biomedical engineering at both the technician and post-graduate levels. Other areas suggested were instrument maintenance, computer programming oriented toward data control and interrelation of laboratory results with other clinical data, and electronic and isotope technology.

Where sub-baccalaureate personnel will fit, and how many will be needed, was not agreed upon. Many foresaw increased needs for graduates of high school and post-high school programs to perform routine activities and handle large-volume automated testing. Others thought that the need for greater laboratory competence would reduce the number of positions this level could fill.

No quantitative predictions were made, except for the expression by one group that personnel needs would at least double within the next decade, taking into consideration population increase, the shift of population to more persons in the older and younger age groups, the extension of sophisticated and preventive medical care to a larger segment of the population, and the increasing trend toward specialization.

Participants agreed that staffing patterns should be kept flexible and reviewed frequently to examine new responsibilities and new opportunities for different types of personnel.

How to Educate Laboratory Personnel?

Participants expressed the opinion that, to prepare medical technologists able to meet the ever-growing and changing demands of the clinical laboratory, education must provide a stronger academic background in science as well as in the humanities. Graduates will need to be able to understand and adapt to technological change, have the capacity to "think how" as well as "know how," and be motivated to continue their professional development.

The consensus appeared to be that basic education of medical technologists belongs in institutions of higher learning in close cooperation with medical laboratories. A strong baccalaureate 4-year curriculum was favored, with emphasis on scientific theory and principles, followed by or integrated with hospital internship or clinical experience.

It was generally recognized that the primary components of the clinical period which cannot be duplicated in a college setting are the professional attitude of responsibility toward the patient and the development of skill proficiency under pressure. There was disagreement as to the time, duration and content of the clinical period. Some felt that intelligent, well-motivated students with strong basic scientific backgrounds could be given specialized laboratory training in a relatively short time. They maintained that four years of college were required to provide sufficient proficiency in such subjects as physics, instrumentation, genetics, statistics, electronics, immunology, radioisotopes, medical mycology, and so forth.

During the four years of college, it was suggested, students would develop understanding of fundamental concepts and, if facilities were provided, could attain familiarity with medical laboratory procedures. A subsequent period of training which some suggested might require only three to six months -- would develop the skill and speed to meet daily laboratory requirements. Such a system, it was pointed out, would imply accreditation of professional programs in educational institutions rather than hospitals.

Other participants favored retaining the present "three-plus-one" program. They suggested possible improvements such as integration into a university structure, possibly an allied health professions school; strong affiliation between colleges and laboratories, with a "recognized" baccalaureate degree given at the end of four years; qualified and academically oriented clinical instructors, and opportunities for students to prepare research papers, attend seminars, and possibly have night and weekend sub-internships.

Doubt was expressed that didactic or even laboratory instruction in college could substitute for laboratory experience and patient contact. Those holding this view maintained that three to six months were not enough to train students in the variety of techniques in which they must be proficient, and that reduced laboratory training would result in increasing the probationary period on the first job. The general community hospital school of medical technology was favored on the grounds that its atmosphere is conducive to developing good professional attitudes and patient relationships.

It was pointed out that effective AMA-accredited schools could be expanded to meet future personnel needs if financial aid were available. Revision of government policy was urged to broaden federal support of training for health personnel to make it applicable to medical technology training in AMA-accredited hospital schools as well as in colleges.

Development of interdisciplinary science core curricula in colleges for all students preparing for health fields was recommended for study and exploration. Core instruction for students with different occupational goals within the health field would promote economy in teaching and in use of laboratory facilities and strengthen recognition of the health team concept. At the same time it would allow for mobility to higher jobs or laterally to allied fields. Introductory courses should stress basic concepts, and academic credits should be given for them. One suggestion was for an integrated science core drawn from basic physics, chemistry, biological science and mathematics. Another suggested course would cover statistics, computer science and related information.

In general, there was agreement that strong science courses provide the best bases for understanding and adapting to technological changes and the best insurance against job obsolescence.

Technologists engaged in teaching should have training in how to teach. It was suggested that more opportunities in teaching methodology be provided through continuing education and/or graduate study. While it is preferable for medical technology teachers, both on campus and in laboratories, to have their major time available for teaching responsibilities, they should retain some role in the laboratory, perhaps in problem-solving and developmental projects, to keep in touch with day-to-day laboratory practice.

Courses of sound academic quality specifically related to laboratory skills should be available in junior and community colleges. They could include biology, applied mathematics, applied chemistry, and physics. It was felt that academic courses in junior colleges should be of standing to permit transfer of credit to four-year baccalaureate programs. Junior colleges are requesting and are receptive to guidance from professional organizations, but they will go ahead without it unless such organizations present programs designed to fit laboratory needs and lead to laboratory jobs.

It was recommended that for the present, sub-baccalaureate training programs should not exceed two years, except for cytotechnologists. It was agreed that junior college students with clinical laboratory training would have a role to play as medical technicians but there was disagreement as to whether this would supersede or augment the 12-month post high school training program for certified laboratory assistants as presently constituted. There was some feeling against having three generalist categories -- Medical Technologist, Medical Technician, and Laboratory Assistant.

Since the baccalaureate degree provides the foundation upon which the technologist enlarges his scientific background, concern was expressed that educational and career advancement opportunities may be blocked because some graduate schools do not recognize baccalaureate degrees in medical technology. While others pointed to the growing number of medical technologists entering graduate school, it was agreed that the academic status of medical technology degrees needs to be upgraded so that they will be acceptable for credit in all reputable graduate schools.

The importance of increased graduate opportunities was stressed in several groups as a means of attracting persons of higher competence, as well as helping to open up higher-placed positions with greater responsibility, higher salaries and prestige, and appropriate titles. Graduate programs are needed in such areas as automation, education, supervision and systems management.

In general, there was feeling that experimentation should be encouraged in all aspects of laboratory education, and outmoded rules reviewed and perhaps abandoned. Less rigid reliance on clock hours as a measure of accomplishment or of preparation for professional training was urged, with the suggestion that mechanisms for demonstrating competencies be developed. One group indicated that the A.S.C.P. Board of Registry of Medical Technologists should take into account in their evaluation of college transcripts the recently revised course content of basic sciences, particularly physics and mathematics, as well as the growing trend toward placing students in advanced standing courses.

It was stated by some participants that it is the college or university's responsibility -- not a registry's -- to judge whether a student is prepared for professional study. To do this the university must, of course, understand what science foundation is essential for the profession.

Development of ways of measuring competency and skills by means other than written examinations was suggested. More comprehensive examining systems would, it was felt, result in more flexible training and a broader base for certification. It was reported that the A.S.C.P. Board of Registry of Medical Technologists has initiated reappraisal of Registry requirements for college pre-requisites and establish equivalency standards.

How Can Laboratory Personnel Keep up to Date?

Programs of continuing education, as well as various types of in-service training, are necessary to keep skills up to date and promote career advancement. Subject matter suggested by participants for continuing education ranged widely. Suggestions included: new advances in basic sciences, electronics, instrumentation and methodology; organization and management; refresher education for inactive laboratory workers wishing to return to work. Skill re-training required by changes in laboratory methodologies and instrumentation can be based on reliable procedures and instrument manuals, and varied according to the needs of the individuals and institutions involved.

Most desirable, it was stated, is education covering concepts as well as facts, and substantive courses with individual instruction and practical experience in addition to lecture. Noting that the trend is toward longer, intensive multi-state and regional continuing education programs, the urgent need for programs in small communities and rural areas was stressed. Although participants in continuing education programs tend to be senior medical technologists, it was estimated that each of these passes on what he has learned to an average of five or more technologists.

The need for a clearinghouse or directory of continuing education courses of interest to laboratory personnel was stated. Establishment of a clearinghouse might encourage development and application of methods of evaluating continuing education courses for the benefit of their prospective students.

A variety of techniques for effective continuing education was described: tapes; two-way telephone for questions and answers (from a university to extension campuses); correspondence courses; traveling faculty to instruct and examine personnel at local laboratories, traveling laboratory seminars, tutorials, programmed learning; closed circuit TV; single concept films.

Recommendations for stimulating and motivating wider participation in continuing education programs included:

*"Enlightening" laboratory directors and administrators on the value of supporting continuing education for all laboratory personnel;
*Establishment of in-service career development programs in hospitals during working hours. They could include seminars, staff meetings, journal clubs, and instruction on new methods, developments and instruments;
*Making programs more flexible to permit ease of re-entry and continuation;
*Rewarding pursuit of continuing education by appropriate salary considerations, academic credits and job advancement.

It was also suggested that hospital trustees, hospital administrators, local medical societies, and Congress needed to be convinced of the value of continuing education programs so they would provide budgetary support for them.

It was recommended that medical centers be encouraged through grants-in-aid to provide post-graduate education leading to a certificate and/or degree. They could also provide programs on how to conduct continuing education that would generate local satellite programs. A further recommendation was that present grants-in-aid programs be continued and augmented, and that the Bureau of Health Manpower of the Public Health Service establish an advisory board of laboratory specialists to assist in development of continuing education programs for laboratory personnel.

How Can Certification and Licensure Affect Standards?

Sound licensing laws and their effective enforcement can provide a basis for establishing and maintaining standards for medical laboratories although neither certification nor licensure can guarantee high performance.

Guidelines for professional standards should be developed and defined by the professions affected and should be based on descriptions of the duties involved, with the realization that changes in technology and manpower needs for the medical laboratory will eventually render such descriptions obsolete. Education, experience, and equivalency standards therefore must be kept flexible and open for reevaluation depending on the scientific and technological evolution.

Licensure is designed to protect the public against inferior health care. While it is recommended that the professions to be affected should actively participate in the development of laws and regulations, caution should be exercised so that licensure does not end up as a device for those professions to take control for their own interests. The "guild concept" should be avoided. It is therefore recommended that the agency administering the licensing program have an advisory board of representatives of the scientific disciplines involved as well as knowledgeable representatives of the public.

Voluntary agencies have a role in improving laboratory performance irrespective of licensure laws. Voluntary certification serves as recognition by peers, implies a degree of competence in the profession, influences education and training for the profession, and serves as a stimulus for professional improvement. Certification and licensure meet different needs and different functions -- both are desirable.

For the purpose of discussion, Group V chose to define licensure as a state or federal law or statute, a legal requirement, and certification as a non-government, voluntary measure which is not necessarily required of an individual to practice.

The basis for licensing laboratory personnel is to assure that the individual who supervises and interprets tests is able to practice and continually exercise scientific judgment and has adequate education and training for these tasks. It was recommended that laboratory personnel ordinarily supervised by medical technologists or other professional laboratorians not be licensed except when given responsibility to perform tests independently and without immediate professional supervision. Licensing at subprofessional levels, it was thought, would create an unnecessarily rigid personnel system and hamper career mobility and development of new categories as needs arise. It was recommended, therefore, that licensing be confined to personnel in professional and supervisory categories.

A dissenting opinion was that all levels of personnel be licensed, on the basis that in practice, supervision is often diluted and technicians and others on lower levels perform a certain amount of work without close supervision. Limited discussion was held on the subject of continuous or periodic re-licensing to assure continuing competency but no conclusions were reached.

The definition of job categories mentioned earlier was called necessary to the establishment of adequate standards. Three criteria were proposed for setting standards: education and/or equivalency; training and/or experience in a clinical laboratory under qualified supervision; and examination. Although formal education need not be the only route, especially in the sub-professional levels, it was stated that for the professional positions, formal education provides the surest means of assuring the background and understanding necessary for making independent judgments. A minority felt that no substitution for formal education should be allowed by the licensing board once the "grandfather" period elapsed. Others maintained that this would lock individuals in on lower rungs of the career ladder, and thus represented a disadvantage.

A recommended standard for state licensure was the requirement of the A.S.C.P. Board of Registry of Medical Technologists of pre-requisite college and graduation from an AMA-accredited School of Medical Technology. Other criteria recommended for consideration were education or preparation equivalent to the Registry requirements, Medicare regulations, state licensing laws already in operation, and standards of other groups such as chemists and microbiologists. States would add individual regulations in regard to determination of equivalency, grandfather clauses, qualifying exams and reciprocity.

Licensure laws should provide means by which experience could be substituted for academic requirements. This would hold particularly true if licensure for sub-professionals were instituted. If this were done, length of experience and evaluation of competency by employers would need to be considered.

Accreditation of schools, which serves to identify qualified schools for the public and the profession and to stimulate development of educational standards, can also serve as a guideline for licensure requirements. Discussants suggested that if accrediting is to achieve these goals, the accreditation agency should consider offering its services to all schools submitting programs for evaluation. This, it was felt, would give the public a national system of evaluation, and might eliminate the confusion caused by multiple registries and accrediting groups.

Only if professional societies, state health departments, and academic institutions work together, can training, certification and licensure programs provide the flexibility needed to keep up effectively with the personnel requirements of the laboratory.

How to Promote Mobility in Laboratory Careers

Rigid boundary lines between levels of personnel are discouraging to persons at work in laboratories and a deterrent to potential recruits. It would be advantageous to increase mobility between the principal levels of medical laboratory personnel and between the categories within the levels.

There was disagreement as to what extent a career ladder exists now and whether it will provide opportunities to move upward in the future. One group maintained that there will be little room for the less educated to advance in the medical laboratory of the future. Most participants, however, believed that more mobility is feasible. The two means most likely to increase freedom of movement were thought to be (1) equivalency tests to grant credit in lieu of college and clinical training requirements, and (2) a common core curriculum on which individuals could build their specialties. The latter proposal called for development of beginning level basic courses in fundamental medical information and medical terminology that would dovetail with the duties and responsibilities of higher levels.

There was disagreement on the probable staffing patterns of the automated laboratory of the future which, some felt, will have few gradations between minimum-skilled and highly-trained personnel and thus will afford little room for the progression of average employees. There would be some exceptions, it was recognized, such as personnel with special dexterity or expertise in instrument maintenance, operation and repair. For most, however, possession of a thorough clinical science background was judged to provide the surest means of advancement.

Equivalency testing could, it was stated, make possible the recognition of knowledge obtained by individuals through self-study, experience, maturity, and skills gained on a job rather than through college study. It was recommended that efforts be made to encourage recognition of such equivalency tests by colleges and universities for admission to advanced and graduate study, to effect continuous career mobility.

Representatives of the medical laboratory disciplines and educational testing and measurement specialists will need to work together to develop methods to equate experience with education and education with experience. There was some feeling that it might take significant time for the two groups to develop common ground on which to communicate effectively with each other.

Construction of equivalency testing instruments must, as indicated previously, be preceded by development of job descriptions indicating the knowledge, skills and cognitive abilities required for levels of laboratory personnel. Test specialists stated they could assist in formulation of job descriptions and that doing so would facilitate the development of equivalency tests. It was pointed out that equivalency tests, in addition to providing credit for components of formal courses, may also detect areas of deficiency in theory and technique and permit an individual to fill in knowledge gaps needed for job advancement.

Equivalency testing is not confined to paper and pencil tests, but refers as well to evaluation devices such as video tapes, demonstration of errors (to see if the observer detects them), ratings of performance and conduct in laboratory situations, etc. It was pointed out that while tests can evaluate knowledge and skills, they are not necessarily reliable in judging attitudes, motivation and psycho-motor abilities. Equivalency test experts could work with laboratories in developing methods to measure television and correspondence courses, and other special training. Such tests might also enable personnel to get credit for what they have learned in the laboratory in order to enroll with advanced standing in college. Similarly, equivalency tests could permit those trained in armed forces laboratory programs to receive credit for military training and experience.

More scholarships and loans are needed, it was reported, for senior college courses for ambitious laboratory personnel having no college or only junior college education.

Participants examining licensure stressed that licensing laws should recognize in their requirements some substitution of knowledge acquired outside of formal education. The consensus was that determination of equivalency for college study would be the responsibility of the academic institution, and equivalency testing for clinical training would be the responsibility of the profession.

Where are the Potential Sources of Future Laboratory Manpower?

Sources to be tapped for laboratory employment include high school students, junior college students, college science students and graduates, military laboratory personnel returning to civilian life, disabled persons with handicaps that do not preclude adequate performance in laboratories, inactive medical technologists, older persons who want to enter or re-enter the labor market, hospital volunteers and aides, and disadvantaged persons with ability and talent.

It was recommended that information about medical careers be directed to students at least as early as the sixth grade, continuing through junior and senior high schools. The suggestion was made that students be attracted first to the general area of health careers, then to science-oriented fields, finally to specific roles in the clinical laboratory.

College science students represent the most immediate source for medical technology and other supervisory and specialist categories, but the laboratory must compete with other science fields for their attention. To make college students more aware of opportunities in the allied medical professions, a unified, coordinated recruitment program was proposed, possibly starting with seminars at the freshman level developed in liaison between the colleges, the hospital schools, and the professional organizations. It was suggested that closer affiliation between colleges and the hospital schools of medical technology might lead to better integration of clinical and academic experiences during the entire four years. It was also proposed that colleges be encouraged to take greater responsibility for all four years of medical technologists' training, including academic evaluation of the clinical year. It was recommended that these proposals be sent to the A.S.C.P. Board of Schools of Medical Technology. It was proposed that representatives of institutions that have achieved meaningful types of affiliation draw up recommendations and guidelines to extend their use and usefulness to others.

Formation of a program directed to science students at junior colleges was recommended. It should encourage those able to transfer to four-year programs in medical technology to do so, and stimulate terminal junior college students to enter cytotechnology or laboratory technician or assistant programs.

Women with children in school who want to enter or re-enter the labor market are an increasingly important potential source of laboratory personnel, it was agreed. Appropriate refresher courses, flexible schedules allowing part-time work, and possibly some changes in attitudes on the part of laboratory supervisors, can help attract and retain these candidates for employment. It was reported that one group to which exploratory recruitment efforts have been directed is the inactive medical technologist with several years' experience in the field. A re-training program for these candidates has been developed.

It was suggested that women without a background in medical technology but with a college science education or degrees might be available for laboratory careers if science refresher courses were offered. Similarly, those without college education might be interested in laboratory assistant and histologic technician training, or if they meet the two-year college requirement, could attend cytotechnology schools. Groups emphasized the advantages such employees offer in stability and lack of turnover if working conditions can be adapted to fit their needs.

"Men would be another stabilizing force if we could get them," stated one participant. A possible source is the military service. The group examining this source in detail pointed out that it would be shortsighted not to take advantage of the training and experience given in armed services laboratory programs. The largest is the Army's which annually trains about 900 persons in a short-term, 14-week course as "medical laboratory specialists." A few additional personnel are trained for cytotechnology and medical technology. Based on the current retention rate, out of the 2,800-odd technicians now in the Army, it was estimated that about half -- or some 1,400 -- will return to civilian life. While those who have had the 52-week training qualify to become certified laboratory assistants, career lines for the others depend on individual qualifications.

A discussion group praised the concept of the new Project Transition of the Department of Defense. It is exploring the feasibility of offering in-service training in 34 occupations, of which "medical technician" is one, to enlisted personnel during their last months of service. A pilot program of the Departments of Defense, Labor (USES), and Health, Education and Welfare is seeking to call health career opportunities to the attention of veterans as they leave service. It was recommended that the military services be given all possible assistance in providing information to their personnel on laboratory careers. The advisability of urging military personnel to use their G I Bill benefits to get education and training for higher level laboratory employment than they would be eligible for without such preparation was mentioned.

Efforts might also be made to enlist retirees from industry and government possessing skills that may fit into some aspect of laboratory work, possibly administration, record-keeping, and similar responsibilities.

The potential of training the disadvantaged for laboratory careers needs to be explored. Laboratory directors and supervisors should come to realize that such persons can rise on the career ladder if educational and in-service training opportunities are provided, and they are not relegated permanently to bottle-washing. Disadvantaged persons themselves need to realize they can be helped with special preparation to become eligible for laboratory training. Government agencies should recognize that the same type of commitment for funds as has been provided for cytotechnology could bring students through medical technology education. It was suggested that the term "disadvantaged" could include those with insufficient funds for education, those lacking education, and persons with physical and emotional handicaps. Regional or central testing centers were proposed to assess individual aptitudes for laboratory work. A trial period in a laboratory environment was another suggestion.

It was noted that the percentage of young people from rural and small-town high schools who enter health fields is smaller than that of metropolitan graduates, one reason given being the inadequacy of science teaching in such high schools.

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This intensifies laboratory shortages in the small hospitals. Investigation might determine ways to direct more rural youths to the laboratory manpower pool. Non-urban young people trained for this career might remain at or near home and seek employment there.

Strengthening high school science courses in small rural and inadequate urban schools, perhaps through correspondence programs, programmed instruction, television and mobile laboratories was suggested. Another idea presented was extension of "Upward Bound" projects to allow disadvantaged students to attend summer school or special courses in science. Career ladders that would provide plateaus to be attained in steps were submitted as valuable incentives to the underprivileged. A new thought introduced was to provide "lattices" rather than ladders to attract other hospital workers into the laboratory, specifically nurses' aides, practical nurses, operating room technicians and similar categories.

How Can New Recruits Be Attracted and Retained?

School environment, peer influence, and parental attitudes were named as key factors in influencing career choice. Combining recruitment efforts for all health careers, rather than recruiting separately for the medical laboratory and other fields, was stressed. Cooperative, coordinating efforts of state, regional and local health career councils to direct attention to medical science study are helpful. The councils endeavor to make health careers a major area that can compete with industry and government recruiters in high school career programs and on college campuses.

Science teachers and librarians should be enlisted to direct information to the attention of potential recruits, starting in elementary schools, many of which now conduct Science Fair projects. The assistance of guidance counselors is also effective. One large university medical center reports good response from one-day courses on health careers for high school and college counselors. It was mentioned that better counseling is needed on the applicability of high school and college academic subjects to health vocations. Many counselors are not well-informed in this area.

Characteristics of laboratory careers that can serve to improve their image are: opportunity for service; variety of tasks; individual recognition; serving on the medical team; new and challenging specialties; possibilities for advancement. Efforts should be made to improve the less attractive aspects: closed-end careers; need for more opportunities for advancement; need for more opportunities for continuing education; low salaries.

The salary level particularly is a major deterrent for men planning lifetime careers. Since male staffs can provide continuity and stability, it was urged that this economic factor be the subject of concerted action. It was indicated, however, that opportunities for growth and advancement are to many of equal or greater importance than beginning salaries.

Some specific ideas for local recruitment were:

* A central agency should collect information about volunteer programs, summer work opportunities, club activities, and other features of interest to teenagers, and disseminate this information.
* Career workdays in class or a local laboratory could demonstrate what laboratory personnel do on a typical day.
* Personal contacts by medical technologists and other laboratory employees is probably the most important single influence, and should be encouraged.
* Medical technologists can assist science teachers, guidance counselors and parents by informing them of specific requirements for the various laboratory careers and by advice on matching talents and abilities to different levels of opportunity in the laboratory.

- * Better communication between persons active in local and national recruitment could facilitate collection and dissemination of materials and programs for image building and recruitment.
- * More high schools might initiate introductory courses covering career opportunities, medical laboratory terminology, simple clinical testing, etc., to motivate some graduates to enter laboratory assistant schools, others to go to college.
- * Personable representatives should appear before the public in behalf of laboratory careers, and should be assisted in making effective career presentations.
- * Special targets should be pinpointed for attention -- the young man who likes machines, the girl who loves biology, those who want to work directly with people, those who prefer working alone in research.

APPENDIX

Presenting

- * Alphabetical List of Conference Participants
- * Excerpts from the Background Papers prepared for Discussion Group participants
- * Selected material from the Resource Books prepared for all Conference participants to provide articles, tables, charts, pamphlets, and special studies pertinent to Conference issues
- * List of published materials included in the Resource Books

Note: Materials included in the Appendix are principally those produced specifically for the Conference and therefore not generally available. Some were intended to provoke debate or present opposing views, and inclusion in the Appendix does not indicate concurrence or approval.

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Excerpts From

BACKGROUND PAPER # 1

NEEDS AND POTENTIAL SOURCES FOR LABORATORY PERSONNEL

Summary

While the estimators differ on the numbers and levels of additional employees needed for competent staffing of the nation's medical laboratories, all agree that requirements for new recruits in the next five, ten and future years will be substantial and will exceed present expectations of supply.

As concluded in "Future Needs for Medical Laboratory Personnel" in the Resource Book, the consensus is that some 200,000 persons may be needed in medical laboratories by 1975, compared with about 100,000 on hand now.

The principal classifications of medical laboratory personnel within the sphere of this conference include:

Registered Medical Technologists (3 years of college, plus 1 year of approved training). A key member of the laboratory staff. Demand is expected to continue to exceed supply.

Specialist Technologists, such as nuclear medical technologists, instrumentation programmers and other specialists attendant upon new developments in laboratory medicine. Post-college training usually required. Demand is expected to be high.

Certified Laboratory Assistants, Histologic Technicians, and other technicians at level of high school graduation and at least 1 year's approved training. Demand will likely exceed supply for the foreseeable future.

Cytotechnologists (2 years of college - 1 year of training). Supply may be adequate by 1970, if present rate of recruitment holds.

In addition to these major classifications, it can be assumed that there will be additional needs. Among them: bench scientists (below the doctorate level); medical biomedical engineers; equipment technicians (to maintain and repair equipment and automated instruments); autopsy assistants (dieners); laboratory aides.

The National Committee for Careers in Medical Technology has conducted programs during the past dozen years to step up enrollment in AMA-accredited Schools of Medical Technology. NCCMT has seen the enrollment of medical technology students increase from under 2,400 to about 4,000 a year in this period, and at the same time has promoted the recruitment of cytotechnologists, histotechnologists and Certified Laboratory Assistants. (About 1,100 students are currently enrolled in CLA Schools.) The standard recruitment aids of films, pamphlets, posters, exhibits, speeches, cooperation in Career Day and other meetings, publicity in magazines, newspapers and by radio-TV, and miscellaneous other media, have been used extensively and continuously.

In addition to programs to recruit students to medical laboratory careers, NCCMT directs efforts to reach other audiences. In cooperation with the Vocational Rehabilitation Agency, a project is under way to expand opportunities for the physically handicapped in medical laboratories. A project conducted under contract with the Bureau of Health Manpower of the U. S. Public Health Service seeks to bring back to work inactive medical technologists. Programs developed in connection with the Manpower Development and Training Act and the Vocational Education Act provide laboratory training opportunities for the unemployed and underprivileged.

Data on these programs follow.

Employment Potentials of Professionally Inactive Medical Technologists

A 1965 survey by NCCMT found that of the 40,000 medical technologists then on the rolls of the Registry of Medical Technologists, 10,000 were inactive but had thoughts of going back to work some time. Of these, 1,000 indicated willingness to return immediately if adequate retraining and suitable employment and remuneration were offered. Responses from several technologists indicated the importance of adequate salaries to attract these individuals back to work.

In addition to the inactive Registered Medical Technologists who are potential laboratory recruits could be added an unknown number of other technologists who let their certification lapse, who had college-level training but never took the examination, and others. Perhaps the total number of retrainable former laboratory workers that could be recruited would reach 2,000 per year.

Since the survey was made, Curriculum Guides for Re-Training Medical Technologists have been developed for use by hospital laboratories and other institutions acceptable for retraining. A Handbook for Organizing a Medical Technology Recruitment and Re-Training Program Within a Community is also available.

Employment Potentials of the Handicapped

On July 1, 1965, NCCMT undertook on behalf of the Vocational Rehabilitation Agency a 3-year project to explore recruitment of disabled personnel to medical laboratory employment.

A national survey to determine extent and experiences of handicapped laboratory employees found that 443 of 2,000 laboratory directors responding employed 693 handicapped persons. 91% were rated satisfactory by the laboratory directors. The employees worked at all levels of training and skills: over 40% were Registered Medical Technologists, the remaining 60% being predominantly cytotechnologists and laboratory assistants.

Currently, a demonstration phase of the project is under way in three eastern states to increase cooperation between vocational rehabilitation counselors and medical laboratory management, with the objective of bringing more handicapped people into medical laboratory training and employment.

Employment Potentials of the Disadvantaged

For about two years, NCCMT has been working with the Office of Manpower, Automation, and Training of the Department of Labor and with the Office of Vocational Education of the U. S. Office of Education on utilization of disadvantaged persons in medical laboratories, principally as Certified Laboratory Assistants. The project, financed under a Department of Labor contract, is collecting data on the training and success in employment of over 400 students representing minorities, undereducated, middle-aged women, displaced workers, and other disadvantaged.

The experience of one state, North Carolina, indicates a good potential in the disadvantaged as Certified Laboratory Assistants. The C.L.A. School at Wake Memorial Hospital started in September, 1964, enrolled 11 students, five of them disadvantaged. All 11 of these graduates are still successfully employed in their original jobs except for one who is in the armed forces. Of 39 additional students enrolled that year, 19 were disadvantaged. From this experience, according to William F. Andrews, administrator of the Wake County Hospital System, "the staff is convinced that the C.L.A. Program is not only fulfilling a great need for laboratory assistants, but is meeting a genuine personal need for the disadvantaged student and placing people in the work force who would otherwise be unemployed."

Experiences from the "Upward Bound" program of the Office of Economic Opportunity also point to the potentials of the disadvantaged, if given training and motivation.

Employment Potentials of Former Military Personnel with Laboratory Training or Experience

The U. S. Navy has two programs to train medical laboratory personnel: a 3-months course to become a Clinical Laboratory Assistant and a 14-months course as Clinical Laboratory and Blood Bank Technician.

According to the Chief of the Navy Laboratory Service, the 120 graduates of the 3-month program would not be "capable in civilian institutions except for the occasional one who applied himself" and took extra training. Of the 200 graduates of the 14-month course, the Navy's laboratory head estimated that almost one-half of them "take jobs in civilian laboratories. As a rule they get less money and jobs of lower prestige than when in the military.....unless they have been in for 20 years. Then they are often sought by small hospitals to be Chief Technicians."

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The Army has two training programs for laboratory personnel: a basic course of 14 weeks graduates approximately 875 "medical laboratory apprentices" a year, and a 50-week course graduates approximately 150 "senior medical laboratory specialists" per year. The Army's current retention rate is 54%, indicating that about 46% of the Army's two principal classifications of trained laboratory personnel might become available for civilian laboratory employment. According to the Army: "The number and position of technicians entering related civilian occupations when discharged is unknown."

Training is also conducted by the Army to prepare students for the MT(ASCP) Registry Examination. Ten officers and 14 enlisted men enrolled in this program in fiscal 1967.

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Defense Department's "Project TRANSITION"

The Department of Defense is exploring feasibility of offering in-service training in 34 occupations, of which "medical technician" (their wording) is one, to enlisted personnel who have from one to six months service time remaining and have expressed their intention not to re-enlist. The program is intended to provide military retirees with a skill or additional education that will enhance their employment opportunities. The possibility of extending the program to personnel discharged for disability reasons is also being explored.

Role of Junior Colleges in Training Medical Laboratory Personnel

I. Junior College - Projections for the Future:

Year	Number of Junior Colleges	Fall Enrollment
1966	837	1,464,099
1970	1,000	2,150,000
1975	1,200 (assumes 19% increase)	3,460,000 (assumes constant annual increase of 10%)

II. Courses of Study:

1. Transfer Curriculum - preparing students for 4-year college or university. (About one-third of students transfer.)
2. Occupational Curriculum - also known as Terminal or Vocational-Technical Programs. Usually in 8 general categories, one of which is a health field.
3. Continuing Education - evening courses, special adult programs, enrichment courses, job-training, programs to upgrade persons in their occupations, "Weekend College": (Miami), TV Junior College, (Chicago), etc.

III. Medical Laboratory Programs in Junior Colleges:

1. First two years of a pre-medical technology curriculum, after which student transfers to a 4-year college or university. (Examples: Miami-Dade Junior College, Florida; New York Community College, Brooklyn; experimental course at Forest Park Community College, Missouri.) A few junior colleges, such as Colby, Centenary, and Westbrook, have approval from their State Legislatures to offer a baccalaureate degree in medical technology, with a third year of courses on campus and a fourth year in an affiliated AMA-Accredited School of Medical Technology.
2. Two years of college with biology courses for students planning to enter an AMA-Approved School of Cytotechnology (Quinnipiac College, Hamden, Connecticut).
3. Terminal curriculum for medical laboratory assistant. This can take 2 forms:
   a. 12-month curriculum approved by Board of Certified Laboratory Assistants with graduate receiving a junior college certificate, and certification as CLA upon passing CLA Board examination.
   b. a two-year program with liberal arts courses and CLA curriculum, with graduate receiving an Associate (A.A. or A.S.) degree, and CLA certification upon passing examination. Currently five junior colleges offer one or two-year training leading to the examination to be a Certified Laboratory Assistant.

   A half-dozen or so were expected to start such courses in the fall of 1967, and a similar number in the fall of 1968.

Role of Non-Profit Vocational and Technical Schools

The Office of Education conducted a survey in 1965 of non-profit vocational and technical curricula for training personnel for health occupations. A total of 1,259 institutions reported 1,685 different training programs representing 42 identifiable occupations. Five of these are in medical laboratories. They are: medical laboratory assistant; medical laboratory specialist; cytology technician, histopathology technician; hematology technician. Student admissions in the five medical laboratory programs listed above numbered 2,324 out of the total of 50,296. Completions were 1,220.

Excerpts From

BACKGROUND PAPER # 2

IMPACT OF AUTOMATION AND OTHER ADVANCES IN TECHNOLOGY AND SCIENCE ON MEDICAL LABORATORY PERSONNEL

Benefits of Automation

"The accelerated growth of knowledge of the last 25 years has left no facet of medical technology unchanged. Today's laboratory technologist masters more knowledge than was thought possible even a decade ago, and ever-increasing advances in methodology and instrumentation point toward the expanding role of the clinical laboratory." This quotation from an article in the Ortho Diagnostic Reporter and similar statements are typical of the opinions and findings being expressed by pathologists and hospital administrators nation-wide.

Technological advances in automation, instrumentation and computer systems have had significant effect on the role of the medical laboratory in diagnostic, preventive and research medicine. Evidence so far seems to indicate that the automated procedures used in multiphasic screening produce a higher degree of accuracy and reproducibility of medical tests and intelligence than is possible through conventional procedures. Mass multiphasic screening programs have also been valuable in detecting problems for preventive treatment. Some automated instruments can in one day in the clinical laboratory perform the equivalent of work expected of a laboratory worker in three weeks time. Kaiser Foundation Hospital and the Permanente Medical Health Plan in California examine over 39,000 patients a year in automated multitest laboratories, computer process the data from the tests, and print summary reports for the physician to have available by the time he examines the patient. (More description in Background Paper #6.)

Effects on Manpower

Initially it was assumed by many that automation would decrease both the number of personnel needed and the level of skill required in the clinical laboratory. Both these assumptions have proved false. While automation has increased the efficiency and capacity of the laboratory in terms of volume of work and tests performed, as well as in quality control, it has also increased the demand for large numbers of complex tests difficult to perform.

As stated in "Automation in Clinical Laboratories," the report of a 1966 workshop on automation held by the National Institute of General Medical Sciences, "The special problem of automated techniques increases the demand for highly trained scientists who are interested in clinical laboratory analysis. In the future, it will be necessary to distinguish more sharply between training of laboratory scientists and training for the practice of laboratory medicine. Individuals with both types of training are needed desperately."

Since large numbers of medical laboratory personnel will now have to become expert in many totally new areas and master many new technical skills, it is clear that their training and education will have to undergo considerable modification. New occupational specialists are developing. A growing number of colleges and universities now offer courses on both the undergraduate and graduate levels in bio-medical engineering. A two-year associate degree type curriculum in bio-medical equipment technology has been developed and is now being tested and evaluated in pilot programs in Massachusetts and Texas. Although some large hospitals and medical centers may employ such specialists, most medical laboratory personnel will not only have to perform many of the traditional tasks they have always done, but in addition will need to operate, understand, maintain and adjust complex machines. Laboratorians should be able to recognize significant deviations in the performance of a machine, diagnose problems and make simple repairs quickly. When a machine cannot be readily repaired, technologists should be able to run the tests manually.

It is estimated that approximately 30% of the medical technologist's working time at present is devoted to paper work of various sorts. A considerable reduction in this work load may be accomplished by more extensive application of computer systems resulting in a time reduction equivalent to the addition of possibly several thousand medical technologists to the national pool.

It should be noted that automation in clinical laboratories is placing unprecedented new demands on pathologists for leadership in the areas of research, development and particularly in training for automation.

Economics of Automation

The question of the overall economy of running automated laboratories is one which is still open to some discussion and should probably be studied more extensively and thoroughly before any conclusive general statements can be made. Obviously the volume of health services must be fairly substantial to justify the outlay costs of automation and to reduce the unit cost per patient. But although many pathologists and health manpower specialists have made strong cases for the savings and economies of automated systems, not only in skilled man-hours saved but also in dollar terms, there are others who feel there are not yet enough facts available to develop reliable cost figures. Arthur E. Rappoport, M.D. is now working under a Public Health Service grant to develop such figures. The problem, he believes, is that "we do not know, in our own system, what part of our increased efficiency is due to improved procedures and equipment and what part is accounted for by linking the laboratory to the hospital's computer."

Centralization of Automated Facilities

There is a definite trend toward exploring and exploiting the potential of enlarging the sphere of automated systems to include several hospitals in a community, of regional medical complexes to service larger geographical areas and of linking the facilities of large hospitals to various kinds of clinics, laboratories and extended care facilities. Part of the motivation in this direction is economic. The developing Regional Medical Programs and the benefits of increased efficiency and accuracy deriving from the availability of more complex sensitive computers are also important factors. Background Paper #6 discusses "The Effects of Central, Regional and Other Emerging Laboratory Structural Patterns on Education, Training and Utilization of Medical Laboratory Manpower."

Although the need is recognized for additional training in sciences and engineering, in bio-medical disciplines and in theory and technique of multiphasic screening and automation, development of coordinated educational and training programs has been slow.

Excerpts From

BACKGROUND PAPER # 3

THE ROLE OF CONTINUING EDUCATION IN KEEPING LABORATORY WORKERS UP TO DATE

HEW Secretary John Gardner has said: "Disintegrating is the notion that education is something that goes forward with no interruption until it is capped by some sort of graduation ceremony, whereupon it ends forever. We are coming to recognize that education must be lifelong, that it may be interrupted at many points, and that it may take place in many settings."

The statement is particularly apt for medical laboratory personnel faced with the responsibilities and problems of keeping up with continuous advances in laboratory medicine. Pertinent comments on continuing education appear in "Man, Education, and Work," a publication prepared by Grant Venn for the American Council on Education on a study of post-secondary vocational and technical education. Among these comments:

"The importance of continuing education in a technological society has been underscored at several points in this report. Yet the public institutions of secondary and higher education in the United States as a whole have not demonstrated an appropriate commitment to this area. A principal exception to this rule is the field of vocational and technical education, whose leaders have long recognized the importance of continuing education and who have, with limited public understanding and financial support, made great efforts in this area. But even these efforts have fallen considerably short of the needs for continuing occupational education."

A survey reported in August 1967 by the National Council on Medical Technology Education is an indication of the interest of technologists in continuing their education. Of 193 laboratory supervisors responding to a questionnaire, 55% attended continuing education seminars or workshops in the 18-month period under question. 76% of the supervisors (61% of whom were medical technologists) reported attending meetings of a professional organization in the period.

A report from the Interprofessional Task Force on Continuing Education (University of Illinois, College of Medicine) on continuing education programs for health care professionals states, in part: "It is also worth noting that continuing education is generally an extension of the undergraduate program model: the teacher with a message, the learner waiting."

However, a teaching supervisor with long experience in training laboratory personnel and clear memories of the "read and rote" training offered in former days, expressed the opinion of many medical technology educators when she said: "Continuing education has come a long way. In many instances, medical technology education has been wrongly pitched. Now we are trying to put tools, not answers, into our students' hands. We have learned that the answers we give them today may be wrong tomorrow. Our emphasis now is not so much on teaching factual knowledge, but on how to find and use knowledge."

Some of the Present Programs

No one has complete information on all the scheduled continuing education courses available to medical laboratory personnel. The learning obtained through reading professional journals and texts, attending professional meetings, discussions with colleagues, monitoring training or courses, and other forms of self-education, is even more an unknown quantity.

A number of colleges and universities offer courses or seminars, generally two weeks or longer, specifically designed for medical technologists. The Universities of Minnesota and Alabama and the Medical Schools of the Universities of California and Kansas were among the forerunners in this endeavor. The subjects the 15 universities offer include: electricity and electronics; instrumentation; data processing; quality control; immunohematology; teaching techniques; radioisotope detection of tumors; fungal infections; parasitology; cytology.

The comments of Joseph R. Jannach, M.D., director of the program of the University of Miami at Jackson Memorial Hospital, give an indication of its acceptance. Dr. Jannach said: "The response to the courses has been greatly in excess of our ability to handle ....and I have on file several hundred applications from very well qualified ASCP medical technologists. I am astounded over the need and acceptance of this training." The Florida program, funded through PHS financing for instruction, equipment, and student stipends, offered four courses this year: 4 weeks in Medical Bacteriology and Mycology; 2 weeks in Hematology; 2 weeks Quality Control and Instrumentation; 2 weeks Coagulation.

For the last three years the American Society of Clinical Pathologists at its annual meetings has held workshops (mostly half-day) in about 15 subjects related to advances, problems and new procedures in laboratory medicine. Enrollment in 1965 was about 200 Registered Medical Technologists, in 1966 400-450 (for a total of 1001 sessions, most MTs attending more than one course). 1967 attendance was more than 600.

Other national societies scheduled continuing education sessions at national, regional and sometimes exclusively educational meetings are the American Society of Medical Technologists, American Association of Blood Banks, Associations of Cytotechnologists, American Society of Microbiology, Instrument Society of America.

State and city societies of medical technologists hold educational workshops and seminars. State societies are assisted in these by funds from the Registry of Medical Technologists Seminar Fund. Manufacturers often help state and local societies conduct workshops by providing equipment, supplies or instructors.

A number of new and original programs of continuing education are coming forward. Foremost is programmed education permitting home study. Other developments are "weekend college" courses at the University of Miami and a TV Junior College in Chicago.

Retired medical technologists and other laboratory personnel who return to laboratory work often need education in the form of either refresher courses or instruction in new advances and techniques. The National Committee for Careers in Medical Technology has recently completed, on a contract from the Bureau of Health Manpower of the U.S. Public Health Service, a Curriculum Guide for Re-Training in Medical Technology, for use by approved medical technology schools which will undertake re-training. The Guide, 312 pages in length, has been sent to approved schools of medical technology and additional copies will be available at cost.

The Time Element

The shortage of key people for medical laboratories makes it difficult to spare them from their jobs to take advantage of training opportunities. As the executive director of the American Society of Medical Technologists put it: "Since there is a lack of qualified able-bodied personnel in the laboratory, time off to take courses is hard to come by." Solutions proposed for the problem of finding time are to develop traveling seminars to go to the students, and development of teaching machines they could use themselves at their leisure.

Financing Continuing Education

Continuing education requires funds for the expenses of the institutions conducting the training and funds for the expenses of the students participating in it.

The Allied Health Professions Personnel Training Act, in addition to providing assistance to educational institutions for teaching facilities and enrichment of teaching programs, offers traineeships for advanced education to enable medical technologists to become teachers, specialists, supervisors or administrators.

Funds have also been provided for some university continuing education courses by the PHS Cancer Control Program. Other scholarship sources include:

* The O.A. Brines Memorial Fund administered by NCCMT for MT(ASCP)s to attend certain seminars and workshops.
* The Registry of Medical Technologists Seminar Fund to grant up to $200 to societies or individuals for specific items of a seminar program such as speakers' honorariums or rental of workshop equipment. Individuals may receive grants for items such as travel expenses or fees for postgraduate courses.
* Some state MT societies, as well as the A.S.M.T. Education & Research Fund, Inc., grant stipends to their members for continuing education.

Continuing Education Teachers

While continuing education has been greatly limited by lack of financial support, equally serious is the lack of training directors and teachers. Only scattered support has ever been mustered for developing strong cadres of medical technology teachers -- at the Master's level and above -- who would provide optimum guidance and inspiration for top-grade continuing education of medical laboratory staffs.

New Techniques

Jules Pagano and Derek N. Nunney state in an article titled "Varied Patterns in Education," in a publication of the American Association of University Women that:

> "For the purposes of continuing education for women, home study courses are more effective for career training than other non-classroom learning. Programmed instruction is best for reinforcement of present skills or learning new fields. Educational television has the greatest effectiveness for concentration in one area of a particular field. The perspective is changing, though, with the trend being toward intermixing all forms of learning. The greatest changes will occur through innovations in programmed instruction."

Plans and Hopes

As reported in Background Paper #7 on Education and Training, some 16 "integrated" educational programs for Allied Health Training are now being established. The most recently approved, that at the State University of New York at Buffalo, bases its program on the assumption that continuing education and graduate programs can be relied upon for keeping up with new developments. The plans call for establishment of a "well-equipped, centralized continuing education teaching center for medical technology."

More than 60 universities have formed the Inter-University Communications Council to cover all areas of continuing education in health and education in multi-disciplinary approaches.

The afore-mentioned report on Continuing Education for the Health Professions stated: "Some of the most exciting possibilities for innovation in continuing education, particularly innovations involving multiple disciplines, lie within the framework of the Regional Medical Programs ... As an example of the possibilities, a program has just been approved for financing at the University of Utah that is worthy of note. This project will draw upon a 'faculty' of nationally recognized experts from the fields of medical and patient care, education, economics and the behavioral sciences who will join a series of seminar workshops that will also include the core-multidisciplinary staff of Utah's regional medical program. It is planned that this core staff will carry these experiences back to their respective staffs and communities so that the concepts of comprehensive care can fulfill their purpose of increasing the efficiency and effectiveness in the prevention and early diagnosis and therapy of heart disease, cancer, stroke and related diseases. Undoubtedly, the university's established network, tying the medical center with several community hospitals, will have an important role in this enterprise."

Dr. Eli Ginzberg said at the HEW-Labor conference on Job Development and Training For Workers in Health Service in February, 1966: "One of the great difficulties in the health manpower field stems from the fact that hospitals were never meant to be educational institutions, and they are not staffed to be educational institutions. We must work out a much closer alignment between training of health manpower and the rest of the educational and training facilities in the United States."

It was brought out at the same conference that the health field is big business. Some 3 million people are employed in health services, which now cost about $40 billion annually (about 6% of the gross national product). Continuing education is an important facet in the success of this "big business" -- and ways to improve, enlarge, organize, finance and conduct this education are imperative.

Excerpts From

BACKGROUND PAPER # 4

"PROVIDING CAREER MOBILITY THROUGH EDUCATION AND/OR EQUIVALENT LABORATORY EXPERIENCE"

(Note: Because this subject is one about which so little is known in the laboratory field, most of the original background paper is included here. It was the result of intensive research and individual communications with experts in testing and equivalency.)

Summary

"Upward mobility" is accepted generally as a goal for medical laboratory workers -- as for workers in other fields. The concept of the "career ladder" is used to reinforce with a mental picture the idea that the individual should seek and receive not just a job but the means to a lifetime career.

But many health occupations today are a "dead end," because training for one position -- and years of experience in that position--- do not enable the worker to move higher. Instead, he must go back to school and start training all over again from the beginning. Such restrictions are wasteful to employees and to a field handicapped by a critical shortage of personnel. They reduce chances of gaining new recruits, and they prevent most effective use of present personnel.

The key to mobility lies in equating learning gained off-campus with the requirements of on-campus courses and training programs. This equating can be done by means of "equivalency examinations." The following pages survey ways in which such exams are being used in other fields, as a basis for considering their application to medical laboratory personnel. Principles and problems are pinpointed for further discussion.

PROGRAMS USING EQUIVALENCY

General Educational Development Test (GED).

This is a test for high school equivalency, sponsored by the American Council on Education and administered by the states. The test was established at the end of World War II to provide a way for veterans to obtain the high school diploma required for admission to college. It has continued to prove useful for veterans, and also for mature students who did not finish high school but later need the diploma to qualify for employment or further education. New York State alone gives 15,000 high school diplomas a year to those who pass this test.

Advanced Placement Examinations

Administered by the College Entrance Examination Board and the Educational Testing Service to high school students, these examinations are used by colleges as a basis for deciding whether entering freshmen should be granted advanced placement and/or college credit for college-level work done in high school.

Twelve exams are offered, each prepared by a committee of college teachers, secondary school teachers, and testing specialists. In the sciences, exams are given in biology, chemistry, and physics.

Commission on Accreditation of Service Experiences

This arm of the American Council on Education was formed in 1945 to evaluate the educational achievements of service personnel who have taken specific training programs. It recommends to colleges the credit which might appropriately be given for each course given by the military services. To evaluate the various courses, the Commission makes use of consultants who are educators qualified in the subject area concerned. The Army, Navy, and Air Force courses in laboratory work have been so evaluated, and recommended collegiate credit for each is listed by the Commission. Of course the Commission is advisory only.

Independent "Credit by Examination" programs

Of 300 colleges and universities answering a 1959 questionnaire on the subject, 171 granted college credit by examination. In 105 of these institutions, all departments could or did participate. Another 45 limited the practice to particular departments. Some placed a limit on the amount of credit that could be earned; most students earned less than 15 hours. There was general agreement that credit examinations should be more rigid than those given in regular courses.

New York College Proficiency Examination Program

This is the first comprehensive program set up to test whether individuals have learned by some other means the equivalent of what they should have learned in college-level courses. Four years old, it now offers more than 30 examinations. Most of these are in first and second-year college courses; sciences included are biology, chemistry, geology, and physics. The exams are so difficult that anyone passing the chemistry exam, for instance, would probably have received an "A" in Chemistry I on campus.

The College Proficiency Examination Program test results are accepted by the State Education Department to meet some of the specific requirements for teacher certification.

New the CPEP is developing examinations in the field of nursing. A battery of three tests will show whether a Registered Nurse who received her diploma from a hospital school has learned enough to receive some credit if she later wants to go into a degree program. Another set of tests, in the planning stage, would help a Licensed Practical Nurse get credit for her experience toward an RN course.

College-Level Examination Program

This program was set up in 1965 by the College Entrance Examination Board "to enable individuals who have acquired their education in non-traditional ways to demonstrate their academic achievement." In essence, it will do on a national basis what the CPEP is doing in New York.

General examinations have been developed to measure the basic areas in liberal arts usually completed after two years in college. (English composition, humanities, math, natural sciences, and social studies-history.) In addition, examinations have been prepared to measure achievement in specific college courses, such as general chemistry, geology, introductory calculus. More are in preparation.

The exams are developed by committees of college faculty members, assisted by test-development specialists of the Educational Testing Service. Norms have been established for all the tests by trying them out on college students. The tests are given monthly in centers throughout the country.

The colleges and universities -- and other organizations -- will decide to what uses the examinations will be put. And those responsible for the program are encouraging experimentation. In addition to providing evaluation of credit for transfer or admission of students, the tests are being tried out for counseling purposes.

Some ways in which the tests are now being used by organizations and agencies other than colleges and universities are:

1) one state requires them of all applicants for the bar exam who do not have college degrees;
2) a quasi-governmental agency uses them to determine college equivalency to meet a promotion requirement;
3) graduates of two-year technical training programs in another state may have the results indicated on their records to show that they have the equivalent of two years of college training in certain areas.

Civil Service Commission

The Commission has two equivalency exams. One is given for people who have partial training and/or experience in the field of library science, who may become Civil Service librarians if they pass it. While a CSC spokesman said they have ample evidence that someone without a master's degree in library science can do the work, he also reported CSC is not happy with this particular test.

Those who deal with the accounting test are satisfied it does what it was set up to do: to test whether a candidate has learned to be a professional accountant through experience, rather than via the usual four-year college accounting course followed by the CPA exam.

In setting other standards, including those for medical technologists, the CSC operates with the assumption that experience and education can be equated. But the result is the opposite of the programs discussed above. Because it is an experience-based service, CSC allows applicants with advanced degrees to count them as part of the credit toward experience requirements.

National League for Nursing

The NLN has considered the problem of credit for off-campus learning. They have offered for some years the type of examination now planned by the CPEP in New York, evaluating the nursing knowledge of diploma program RN's who seek admission to degree programs. These paper-and-pencil tests do not measure performance adequately, the director of the NLN Evaluation Service explains, and she continues: "It remains for performance to be evaluated by some form of observation, with corresponding ratings."

American Public Health Association

The APHA's Professional Examination Service has recently constructed for the U.S. Public Health Service an examination to test laboratory directors who are not qualified by virtue of academic training to receive reimbursement under Medicare. The written test, supplemented by a performance evaluation procedure PHS is now setting up, is to determine whether the experience acquired by a laboratory director has made him as competent to run a laboratory as though he had received the required formal training.

Another equivalency testing program developed by the Professional Examination Service is set up to judge whether graduates of foreign schools of veterinary medicine have received training equivalent to that given in this country, and thus whether they are eligible to take state licensing examinations.

SOME PROBLEMS

Can examinations test performance?

Some of the experiences with the programs outlined above indicate this is a difficult question to answer. Most would agree that performance testing hasn't been adequately achieved to date. One problem is that faculty members do not agree on the aims of laboratory work; nor do they know how to measure for the objectives they say they seek.

Norman D. Kurland, director of the New York State Education Department's Center on Innovation in Education, notes that while such tests present special problems, "recent developments in testing offer promise." He cites various forms of programmed tests, such as the ones used on the National Medical Boards; filmed sequences which require a response and computer-assisted instruction followed by computer-assisted tests of performance.

The Reverend Carl A. Hangartner, S.J., coordinator of teacher education at Saint Louis University, suggests that "a combination of measuring devices, including standardized and externally controlled paper-and-pencil tests, oral examinations, controlled observation, and other instruments will be required to identify the needs of the candidates for advanced placement."

How do people gain equivalent knowledge?

On-the-job experience may provide the candidate with some of the information necessary to passing an equivalency examination, but some sort of study is usually necessary too. There are many ways of going about this independent study: adult education courses, correspondence and home study courses, television courses, programmed text books, or just a good bibliography and a lot of determination. Cram courses are of little value if the test is well devised to show whether the individual understands theories and can apply them in various situations.

How would such an examination be developed?

Experiences with equivalency testing point to an accepted procedure for developing such tests, beginning with a definition by those in the field of what is to be tested, and going on to drafting questions and testing the tests. A spokesman for the Educational Testing Service has indicated interest in working on such a testing program in medical technology. The New York College Proficiency Examination Program could be approached for this purpose through institutions in New York State.

Excerpts From

BACKGROUND PAPER # 5

CERTIFICATION AND LICENSURE OF MEDICAL LABORATORY PERSONNEL AND ACCREDITATION OF SCHOOLS

Summary

There is little or no disagreement that proper certification of key medical laboratory personnel is a protection to the patient as well as to the laboratory director and management. The problems come in determining who is qualified to grant certification, and in barring incompetent certifiers from the scene.

Similarly, the usefulness and dependability of accreditation of training institutions depends on the qualifications of the accrediting agencies.

Licensure by government agencies -- local, state, federal -- is a third guardian of competency. However, as pointed out by Robert W. Coon, M.D., representing NCCMT in testimony before the House of Representatives Committee on Interstate and Foreign Commerce regarding a House Resolution regarding clinical laboratories improvement, enacting and enforcing advantageous and workable licensure laws are formidable tasks.

Pertinent excerpts from Dr. Coon's testimony follow.

> "You have already heard of the definite correlation that exists between errors in tests and lack of training on the part of the medical technologist. I am here to present further information on the need for developing and maintaining standards for training and certification, and to report on some of the problems that seem to stand in the way of getting and maintaining them.
>
> "...Some states are considering legislation with grandfather clauses that would let just about anybody in, and others would give the authority to set up and police standards to state health departments most of which are without the clinical experience to qualify for this highly complicated task.
>
> "Probably the biggest challenge of all is the need to assess laboratory personnel requirements in view of the changing demands for laboratory services, and the changing patterns of laboratory organization, performance and methodology. To freeze medical laboratory personnel requirements at their present state would be tantamount to restricting the fullest application of developing medical research and automation. The complications of the present are considerable, but they are nothing compared to the changes that are going to take place in the foreseeable future.
>
> "In conclusion, I would submit for your consideration that legal standards for medical laboratory personnel do not make licensure the badge of respectability

for poorly trained and qualified persons nor should they require that highly trained professionals perform the routine tasks that can be competently done by others. Nor is this the time to discourage the development of new categories and kinds of specialists and technicians."

At present, federal control over laboratory personnel is limited to the regulations requiring certain criteria of education and training of staffs in "independent" laboratories participating in the Medicare program. With the inevitable spread of both Medicare and Medicaid payments to hospital laboratories in all of the 50 states, enactment of national clinical laboratory requirements seems inevitable unless the states individually take steps to establish and enforce federally acceptable standards in medical laboratory operation.

State Licensure Laws

Henry Bauer states in "The National Laboratory Crisis" that: "Legislative standards for laboratory performance and employment vary from state to state. In California, at the top of the range, a college degree plus a postgraduate laboratory apprenticeship are required, as is a stiff qualifying examination for a medical technologist's license. In most states there are no laboratory regulations at all. In between are somewhat limited and permissive regulations adopted by a handful of other states."

Information on operation of state licensure laws obtained from pathologists and medical technologists queried in several states is given below. The information on the California licensure was obtained from "The Laboratory Crisis: A State Shows It Can Be Overcome," and other data by Howard L. Bodily, Ph.D., Chief, Division of Laboratories, California Department of Public Health.

California

California law requires that: all clinical laboratories except those operated by federal and state governments and by physicians for their own patients must be licensed by the state's department of public health; laboratory directors must be either physicians or licensed bioanalysts; medical technologists must be licensed. (Since 1965, licensure requirements for MTs have been a Bachelor's degree, a full year of training in an approved laboratory, and passing grades on a state-conducted examination.)

Dr. Bodily states: "California is the only state with an adequate supply of well-qualified clinical laboratory technologists...California is also the only state with a comprehensive law regulating clinical laboratories and setting standards for laboratory personnel... California standards are more demanding in many respects than those enacted for laboratories participating in Medicare and related state programs.

"California's physicians, laboratory directors, and technologists had been participating in voluntary systems of certification since they were established by the state's board of public health in 1923. It was the medical and laboratory groups themselves that periodically kept raising the standards for voluntary certification of laboratories, their directors, and their technologists...The physicians and the laboratorians supplied the inspiration, guidance and support for the first Clinical Laboratory Act." (The basic law became operative in 1938, was revised between 1949 and 1951.)

A Guide for the use of laboratory assistants in clinical laboratories in California spells out what laboratory tasks must be done only by licensed personnel (technologists, bioanalysts or physicians) and what parts of laboratory tests may be done by laboratory assistants under the supervision of licensed personnel. Only tasks which do not involve decisions or quantitative measurements are permissible for assistants. Examples would be: labeling, centrifuging and transferring specimens, recording results and preparing equipment and reagents.

Hawaii

Medical Technologists' comments on the Hawaii law requiring licensure of all laboratory personnel indicate that since licensure is operated indifferently by an unsatisfactory Board and an inactive committee, the law does little besides collect fees. Amendment of the law in 1969 to set up an effective screening committee to review applicants for licenses, is under discussion.

Pennsylvania

The Analytical Biochemical-Biological Laboratory Act does not apply to laboratories maintained by governments, hospitals, research or industrial organizations or by physicians for their own patients. In practice, therefore, the Act has little effect since most laboratories are excluded, inspection is almost non-existent, and there is no actual licensure except for a test administered to non-physician directors.

The state medical technologist and pathologist societies have engaged in drafting a bill, jointly, to have in readiness when state officials deem it necessary. Discussions so far have been related principally to the standards of education, training and experience to be required of personnel at the supervisory level. It has not seemed advisable or practical to plan licensure of all persons working in all laboratories, inasmuch as licensure carries with it exclusion of other persons.

Florida

Has recently enacted a new law covering all laboratories except for those operated by physicians for their own patients. The previous law covered only non-physician operated laboratories. The new law has not been operating long enough for evaluation.

New York State

A medical technologist commented: "Licensure of laboratories and directors has been successful only in that it has emphasized the need for licensure of personnel. It has been virtually impossible to control the quality of work by licensure of laboratories because of the constant turnover of personnel and the difficulties in identifying what staff members of a laboratory are responsible for various test operations."

A pathologist stated that "there is as yet no evidence that laboratory services have been improved or personnel standards maintained. Ultimately there may be improvement in services by the elimination of sub-standard laboratories."

In New York City, technologists and technicians are licensed by the city. Medical technologist opinion on this is: "New York City's Department of Health Code regulating the qualifications of medical laboratory personnel has brought some order into the field here and promises to be more effective in the future. Standards set for levels of responsibility are reasonable. Adequate recognition is given for education and training such as that required by the Registry of Medical Technologists."

Model Laws

The Task Force on Health Manpower of the National Commission on Community Health Services recommended that "national minimum requirements for licensure of personnel in all the health professions and occupations should be established, with freedom for the states to set higher standards to meet their individual needs. Determination of standards appropriate for each specialty will require a systematic and objective analysis of present licensing requirements in light of education and functions in all the health professions and occupations." The National Communicable Disease Center has developed a suggested model law for state licensure. Guidelines to help state medical technologist societies in the drafting of state licensure measures were recently developed by the Legislation Committee of the American Society of Medical Technologists.

Excerpts From

BACKGROUND PAPER # 6

THE EFFECTS OF CENTRAL, REGIONAL AND OTHER EMERGING LABORATORY STRUCTURE PATTERNS ON EDUCATION, TRAINING AND UTILIZATION OF MEDICAL LABORATORY MANPOWER

Summary

The Department of Labor publication, "Technology and Manpower in the Health Service Industry 1965-75," says that: "Health planners are studying possibilities of regional and local programs for large scale diagnostic screening of the whole population, utilizing computer-based central storage of medical records of individuals that allow for access to patient data by all hospitals and doctors in the area. Some plans feature mass physical examinations in which, as a preliminary to physical examination, there would be administered to a patient a battery of at least 20 laboratory health tests in a period of two hours using automated techniques. The results would be analyzed by a computer and a report printed for the physician indicating abnormal test values and abnormal symptom complexes that require special attention."

Of the effects of such future developments in laboratory medicine on personnel, the publication states: "(Innovations) not only create new kinds of jobs, but broaden existing jobs" by requiring the addition of new skills. The authors believe that many new classifications of high-level laboratory jobs will emerge, such as medical electronic engineers and technologists, but that the coming changes will also provide opportunities for "adapting some health jobs to the capacities of less-trained persons who can thereby make useful contributions to the needs of patient care in entirely new kinds of careers."

A qualifying comment in "Technology and Manpower" points out that as a general rule, adoption of computers by hospitals for use in diagnosis and in clinical analyses, or in any sphere of medical care except accounting and other bookkeeping, has been slower than expected. This can be taken to indicate that central, regional and other new patterns of laboratory structure may not come as fast as a few seers predict.

Surgeon General William H. Stewart, M.D., has stated that clinical laboratories cannot be equipped with automation "unless there is a certain amount of consolidation of effort and provision of capital. I believe that in any community which has more than one hospital, major economies and a great increase in productivity could be provided by at least partial centralization of laboratory facilities."

Federal legislation passed in the last several years is expected to provide funds to hasten the advent of more centralization and regionalization of medical laboratory work (and can also provide assistance in developing and instituting changes and innovations in training programs).

The Heart Disease, Cancer and Stroke Amendments passed in 1965 influence and affect the training of health personnel through the following provisions or phrases:

* The fundamental purpose is "to afford to the medical profession and the medical institutions of the Nation, through such cooperative arrangements, the opportunity of making available to their patients the latest advances in the diagnosis and treatment of these diseases..."

* Named as a process for achieving this purpose are "grants, to encourage and assist in the establishment of regional cooperative arrangements among medical schools, research institutions, and hospitals." Such grants can be "...for research and training (including continuing education)...for related demonstrations of patient care...in the fields of heart disease, cancer, stroke, and related diseases..."

The Allied Health Professions Personnel Training Act of 1966 authorizes:

* Assistance to colleges and universities and junior colleges to expand their already-existing teaching facilities and programs in health fields

* Grants for curriculum development for new or emerging occupations

* Traineeships for advanced training to become teachers, supervisors or specialists in the health field

The Comprehensive Health Planning and Public Health Service Act of 1966 allocates federal funding to states submitting state-wide plans approved by the Surgeon General for hospitals and other institutions providing community health services. The aim is furtherance of the Act's goal of delivering "good health for every citizen to the limit of our country's capacity to provide it" and is expected inevitably to increase establishment of regional medical programs and centralized facilities.

Comprehensive health planning is expected to provide a mechanism to relate three independent programs -- the areawide hospital planning enterprise, the community mental health effort, and the regional medical programs -- to each other, and to other efforts, in the achievement of a total health objective.

An Example of a Centralized Laboratory

An example of fast, mass laboratory testing has been demonstrated in the Pathology Exhibit Laboratories at the AMA annual meetings for the last 7 years. This June the laboratory offered 21 different blood and urine tests to 800 physicians each day of the meetings. Included were procedures in blood chemistry, hematology and serology, urinalysis, and radioisotope T3. Utilizing $350,000 worth of precision instruments, the laboratory staff of 48 completed approximately 16,800 tests daily. It was estimated that a staff seven times as large would have been needed to do the tests by the usual manual methods. The exhibit laboratory's director, Dr. Vernon Martens, pointed out that the hourly test rate of 2,100, surpassed by 100 the entire daily output of his laboratory at the 800-bed Washington Hospital Center. The principal automated instrumentation consisted of the Technicon Corporation's SMA-12 and SMA-7 Analyzers, Warner-Chilcott's Robot Chemist, and Fisher Auto-Dilutors. Many of the technologists had received training from these manufacturers and there were on hand in addition manufacturers' representatives as well as almost two dozen part-time supervising pathologists.

Dr. Martens estimated that as a general, over-all average, about three weeks' specialized training would be required to enable a capable technologist to gain adequate proficiency for this type instrumentation. Such instrumentation is, of course, but a beginning stage of advanced centralization and automation of clinical laboratories.

Multitest Laboratory in Health Care of the Future

In an article under the above title in the May 1967 issue of HOSPITALS, Morris F. Collen, M.D., concluded that an automated multitest laboratory significantly affects the efficiency and economy of health services delivery. He added that such a laboratory operates most efficiently when associated with a medical center offering both inpatient and outpatient services. He stated the opinion, based on the experience of the multitest program operated by the Kaiser Foundation Hospital, Oakland, California, that in the future hospitals in communities of 100,000 or more will be affiliated with this type of laboratory. While this "multi-test laboratory" is more on the order of a facility for periodic physical examinations than the present concept of a clinical laboratory, the article gives a picture of this possible future development in health care.

Studies by the National Committee for Careers in Medical Technology

A study made by a health economist and staff members of the National Committee for Careers in Medical Technology in the last year indicated that technologists working in automated laboratories will require, in addition to greater depth of training in instrumentation, statistics and pure science than they receive at present, proficiency in disciplines outside medical technology. These disciplines may include: principles of electronics, computer mathematics, research techniques, data processing, and systems management. It is predicted by some that the trend in MT training will as a result move toward more specialization and longer and more education to fit technologists for greater individual responsibility for critical and complex tasks and for supervising other personnel.

Simultaneously, technicians, possibly at the level of two years of college plus mechanical or engineering training, may be needed to calibrate, repair, adapt and perhaps operate equipment and instruments.

Another development is the possible emergence of medical laboratories as large scale commercial enterprises. It is pointed out that "outside" contracting for laboratory services, now in effect in some small hospitals, may become common among larger institutions in view of the manpower and management difficulties many hospitals face.

Suggested Changes in Training

A discussion was held at the Department of Labor-HEW conference in February 1966 on "Job Development and Training for Workers in Health Services" on the question of how training programs can keep current with the changing functions of health field employees. The suggestions made at this conference were:

Evaluate training programs continuously, including follow-up of trainees (utilization, performance, etc.).

Revise training courses to reflect changing functions and responsibilities.

Organize new courses to meet changing needs.

Utilize advisory committees to determine necessary changes in training programs (employing agencies, educational institutions, practitioners, community leaders).

Recognize trends in job dilution and effect on job and training requirements.

Facilitate the initiation of curriculum changes.

Consult workers to determine what they see as changes in function, in addition to consulting employers, professional groups, etc.

Develop flexible attitudes toward change on part of instructional staff.

Consider new or changing functions and responsibilities of auxiliary health workers in all inservice training programs.

Promote and maintain good communications between and among employers, educators, professional organizations, employee groups.

Conduct continuing research on changing functions and responsibilities of health service workers and use findings to strengthen training.

Encourage instructors of health occupations training programs to work in the occupation periodically (summer or part-time) in order to keep up with the latest advances.

Develop job descriptions for each level and classification.

Medicare and Other Pre-Paid Plans

Social Security Commissioner Robert Ball reported in July that four million Medicare patients accounted for five million hospital admissions in Medicare's first year of operation. There was an increase from the previous year of 5% in overall hospital admissions, and of 15% to 20% in increased hospital utilization by the aged. (What would the figures for the year have been without Medicare, in the course of general population increase and national affluence?)

In sum, as pointed out in "Automation in Clinical Laboratories," "It is well documented that the workload in clinical chemistry laboratories has doubled approximately every five years during the past two decades and all available evidence indicates that the current rate of growth will continue for the foreseeable future. Further, the recent increased participation of federal programs in providing essential health services can be expected to further augment the demand for the services of clinical diagnostic laboratories."

Effects on Education, Training and Utilization of Personnel

Some of the conclusions reached by an ad hoc committee of the College of American Pathologists, reporting on emerging centralized and consolidated clinical pathology laboratories were: (1) The solo private practice of medicine and clinical pathology no longer can meet the needs of health evaluation, preventive medicine, and patient care. (2) Centralization of laboratories and consolidation of staff, supplies and space are necessary.

The report added: "In true American tradition, the individualism and imagination of pathologists has shown that no two programs are identical."

Projecting effects of laboratory automation on personnel, "Automation in Clinical Laboratories" stated that "Effective training of operative personnel in automation must include didactic material and experience in operation, trouble-shooting, and routine maintenance of automated equipment. The conventional medical technologist's training should be continued but with greater emphasis on the quantitative aspects of laboratory work and with both theoretical and practical exposure to the principles of automation and machine analysis. A new type of laboratory training should be initiated with emphasis on analytic techniques followed by training in the special problems of the biomedical service laboratory and analytic automation. Here the emphasis would be to provide a background in automation as well as training in depth in one of the basic science departments such as biochemistry or microbiology.

"There is (also) a definite place for the individual with a master's degree in automated clinical laboratory discipline...Such persons will fill the role of laboratory supervisor, trouble-shooter, and special problem solver."

How does it all add up? The consensus is that increased demands on laboratories will bring about extensive changes in education, training and utilization of medical laboratory personnel. Some believe the changes will be revolutionary.

Excerpts From

BACKGROUND PAPER # 7

STRENGTHENING THE EDUCATION AND TRAINING OF LABORATORY PERSONNEL

Summary

As new scientific discoveries and fruitful research bring promise of new ways to ferret out causes and cures of disease, it becomes more necessary than ever before to apply the results of these discoveries directly to patient care by bringing them into the clinical laboratories as soon as possible. To do this means that laboratory staffs need to have the scientific knowledge as well as the advanced techniques and skills to be able to bridge the gap between the research and the actual test procedures.

This heightens the importance of medical laboratory education and training, beginning at the top level of the medical technologist -- the college-trained upper echelon worker -- and goes right down the ladder to possible intermediate technician categories with junior college training, and the certified laboratory assistant with post-high school study. Intermingled are also the possible need for formalized uniform training programs in the scientific specialties, and also curricula for specialized new types of technicians, such as the biomedical engineering technician program being developed by the Technical Education Research Center in Cambridge, Massachusetts.

Strengthening Medical Technology Clinical Training

The Board of Schools of Medical Technology of ASCP has recognized that AMA-Accredited Schools of Medical Technology are becoming more academic and less preceptorial in nature, and in an attempt to sustain this trend of upgrading the academic character, has drawn up new Essentials to be submitted to the AMA House of Delegates in June 1968.

The main points of the new Essentials are that new schools of medical technology must be affiliated with an accredited college or university so that the combined program leads to a baccalaureate degree (except for programs which accept only college graduates); new schools should have at least ten students enrolled in each clinical year; prerequisites will include organic or biological chemistry among Chemistry requirements, and at least one course in microbiology among biological science requirements; schools should have available laboratory material equivalent to that provided by a hospital of 250 beds and 7,500 yearly discharges.

The importance of strengthening the clinical year of study was paramount in responses by college medical technology coordinators (many of them medical technologists themselves) to a survey conducted last winter by the National Council on Medical Technology Education. Some comments:

> "Hospital schools of medical technology with very few students -- less than four -- cannot develop a sound educational program... I would like to see fewer hospital schools in each state, centered around the larger hospitals with or without medical school affiliations."

> "The senior year should be primarily academic with a minimal amount of time spent in the clinical laboratory. Training for proficiency and speed should not be a necessary part of the curriculum leading to a B.S. degree. A good understanding of basic concepts coupled with a thorough knowledge of accuracy and precision are vital. Then a paid internship of 3-6 months could develop the skills prerequisite to employment as a medical technologist."

Integrated Educational Programs

Following up on the idea of locating schools within educational institutions is the new recognition by the Board of Schools of "integrated" educational programs -- which now number 16, usually in a School of Allied Health Professions or university subdivision with a similar name.

A form of "core" curriculum is planned in the new integrated medical technology program at the State University of New York at Buffalo's School of Health Related Professions. The Medical Technology department will have responsibility for seminars for freshmen, an instrumentation course for sophomores, an electronics course and seminar for juniors, and all clinical courses. Medical technology, physical therapy and pharmacy students take physiology together in a course offered by the Medical School Department. The medical technology faculty lecture in a core curriculum of the Nursing School Graduate program; the nursing staff is responsible for instruction and supervision of student blood drawing teams; seniors attend Department of Medicine Grand Rounds, etc. Lectures and laboratory on a subject are given on the same day by the same instructor. More direct patient contact is achieved in the structured courses by having students go to wards with instructors to draw samples, returning to discuss the patient and do the determinations in the teaching laboratories.

The idea of core curricula is promoted in the PHS Bureau of Health Manpower's new publication, "Education for the Allied Health Professions and Services." The publication points out that "the possibilities of core courses for certain groups of professions have not been adequately explored. To the extent that students with different occupational objectives receive core instruction, economy in teaching will be promoted, the student's career choice will be broadened, and the functioning of the health team will be strengthened... Laboratory-centered personnel such as medical technologists might study biochemistry with medical students in the general professional training period..."

Educational Innovations

Experimentation is being encouraged at all levels of education and training -- supported financially through the 1966 Allied Health Professions Personnel Training Act -- to develop new curricula, new procedures for teaching, new devices and techniques -- to test them and see that those which are successful are applied directly to teaching situations. Under this act the Public Health Service has given two grants directly related to the medical technology field:

1) Montana State University, Bozeman, Montana, Department of Botany and Microbiology, Dr. W. McBee. "Diagnostic Microbiology Technologist" training program for selected senior students in microbiology (superior students in the medical technology option may be included).

2) San Francisco State College, San Francisco, California, Department of Biology, Dr. William G. Wu. "Advanced Medical Technology Program." Grant to survey the need for a program (if there is sufficient need and demand, it would probably start in the fall of 1968) of advanced education for both graduated medical technologists as well as for senior students in medical technology curricula or those planning to enter training in medical technology.

CUEBS

Another part of strengthening education is the improvement of basic undergraduate instruction. This is the goal of CUEBS, the Commission on Undergraduate Education in the Biological Sciences, which seeks to serve as a bridge between research and college curriculum, encourage experimentation with curriculum, etc. CUEBS set up a Panel on Preprofessional Training in the Medical Sciences (PPTMS), which is planning a computer analysis of returns from a questionnaire on curricula and admissions requirements in medical technology and other medical science schools. The report will examine whether a core curriculum in biology is adequate preparation for a student going into the medical sciences. PPTMS plans to work with professional societies in the field "to insure exposure for the conclusions of this study."

Junior Colleges

With growing interest in the junior and community college and particularly with the rapid growth of the latter as free public institutions, there has been much discussion about their role in training of all varieties, one of these being a laboratory assistant or technician.

In "The Junior College and Education in the Sciences," a report of the National Science Foundation for the 1962-63 year is given on junior college curricula. This lists 155 transfer junior college courses in medical technology (providing the first two years of the three year requisite college education for medical technology), plus 36 "terminal-occupational" and 11 both transfer and terminal. (Three junior colleges are empowered by State Legislatures to give a baccalaureate degree in medical technology.)

Upper Division College

Complementing the junior college growth is the new concept of an upper division college, which would provide continuity of study to the student from the junior year to the master's degree. The concept has been tried in Boca Raton, Florida, at Florida-Atlantic University, and in Michigan, and is now being instituted at the new Richmond College of the City University of New York in Staten Island, New York. Richmond plans to grant baccalaureate degrees in four divisions, humanities, natural sciences and mathematics, social studies, and professional studies (which includes medical technology).

Finding and Educating Better Teachers

A common strain running through comments by many college coordinators answering the NCMTE questionnaire referred to earlier was the need for having medical technologists with academic know-how, and academic appointments for qualified MT(ASCP)s serving on the college campus and in the hospital school. Many felt that hospital instructors with faculty positions should be able to devote their full time to teaching with no service requirements. "Education for the Allied Health Professions and Services," maintains, on the other hand, that "instructors concerned with clinical practice should have, in addition to adequate educational experience, service responsibility. There must be an appropriate balance between the academic and clinical aspects of education, but clinical teaching should never be separated from the service environment completely."

Finding teachers for junior college level and CLA programs is equally difficult, and there will also be a need for teachers to train students in such new special areas as biomedical equipment technology. The State University of New York at Buffalo has developed community college teaching curriculums in the latter as well as other health technology areas (no laboratory area thus far indicated), and has received a $107,800 grant from the Kellogg Foundation to help set up Health Technology Teacher Preparation Centers as national demonstrations.

New Techniques, Devices and Educational "Hardware"

With the lack of qualified teachers in the medical laboratory field, many institutions are exploring new techniques and devices which may have potential in hospital training and in-service education programs to help ease the training bottleneck.

Under the Higher Education Act of 1965, the Office of Education has allocated $2.5 million in grants to 51 colleges and universities in 31 states for short-term workshops and institutions and regular session institutes on teaching machines, computer-assisted instruction, movies, radio and TV, film strips, recordings, etc.

Both open and closed-circuit television have been proving successful in education as a whole and specifically in the medical field.

The Hospital Research and Educational Trust's Hospital Continuing Education Project has set up a Clearinghouse on Self-Instructional Materials for Health Care Facilities at the University of Rochester, with Jerome P. Lysaught, Ed.D. as coordinator. Dr. Lysaught stresses that the basic contributions of programmed instruction are that it is a systematic process of teaching, based on learning theory, provides an explicit set of arrangements for transmitting information and developing skills, and provides for measuring, evaluating and improving the materials. Programmed units in laboratory fields include one by Alberta Plym, MT(ASCP), and J. Aikawa at the University of Colorado Medical Center, "Programmed Instruction in Medical Technology," and units on body fluids and the acid base balance, pH and dissociation, mechanism of urine formation, principles and practice of immuno-hematology, examination of the urine, basic chemistry, and teaching diagnostic skills in hematology.

Excerpts From

BACKGROUND PAPER # 8

THE INFLUENCE OF SOCIOLOGICAL AND ECONOMIC FACTORS IN THE CHOICE OF MEDICAL LABORATORY CAREERS

Summary

There is general agreement that low salaries have been a deterrent to recruitment to medical laboratory careers.

Dr. Eli Ginzberg of Columbia University said at the Conference on Job Development and Training for Workers in Health Services, held in Washington in February, 1966 under HEW-Labor Auspices, that: "Wages and working conditions in a free society, in which people can decide what they want to do, become an absolutely essential part of a general attack on this manpower problem." He also said, "The struggle for social prestige and market power between physicians and nurses, and the nurses and technicians, the technicians and the practical nurses or auxiliary nurses, etc., makes any rational, long-term policy for manpower utilization so difficult to realize. People are motivated to work by the possibility of advancement, of growth, of development, of progress."

Several observers have remarked on the inhibiting effect of a low ceiling on medical laboratory staff salaries. It is contended that people do not care greatly about their first starting salaries. It is the possibility of ultimate reward that attracts.

As pointed out in GIST issue #36, medical technologist salaries are definitely on the rise. An NCCMT survey found that the median annual salary for a full-time MT(ASCP) was $6,144 in 1966. This was a jump from 1963, when the median was $5,190. There are indications that 1967 has brought further and significant salary increases.

The latest figures available on salaries of Certified Laboratory Assistants indicate a salary rise for this category too. Information from certification renewal applications put the 1966 national median for CLAs at $4,320, compared to $3,900 indicated through the same source in 1965.

It has been suggested that a relatively poor public image of laboratory careers may contribute to the recruitment lag. Discussion groups at the HEW-Labor conference mentioned above made suggestions on ways to improve the "image of personal and custodial service positions in the health field." Some may be applicable to medical laboratories. The suggestions included:

Raise wages; improve fringe benefits, working conditions; provide opportunities for advanced training and promotion; stress dignity of each job and importance of each worker; institute programs of rewards, recognizing all levels of work; develop job titles that carry status; provide continuing inservice training programs for auxiliary health and supportive workers; create job ladders and opportunities for open end progression; provide better job satisfaction and security through the development of written job description for all workers; develop a greater acceptance, by higher level workers, of lower level workers; improve supervision; promote the "team" concept; stimulate the organization of membership societies for auxiliary workers; require formal training.

Salary "Fringes"

It is reported in the Department of Labor's "Technology and Manpower" Bulletin that:

> "Most hospital employees work 40 hours weekly and are paid for over-time work either at their regular rate or are permitted equal time off from work. Hospital workers, especially those who must provide direct patient care, must often work Saturdays and Sundays. Many...must work late shifts. Those who work on second and third shifts usually receive shift differentials of $5 to $10 a week.
>
> "Most hospitals provide free meals, uniforms, and laundering of uniforms to certain employees... Most hospital workers are entitled to some sick leave, and to hospitalization and medical benefits. Some form of retirement pension plan is available to most hospital employees.
>
> "Wages of employees in nursing homes, practitioners' offices and laboratories tend to be the same as those of non-government hospital workers in comparable occupations and localities."

Legal Aspects in Sociological and Economic Factors

Under the Fair Labor Standards Act Amendments of 1966, employees of non-Federal hospitals are for the first time included in minimum wage and overtime regulations. However, as newly-covered occupations, the hourly minimum is $1.00 compared to $1.40 for workers in other covered fields. All covered salaries will rise to $1.60 in 1971.

Salary differentials are not the only legal discrimination affecting health field employees. Many hospital and nursing home employees are not covered by unemployment insurance, by the federal Old Age, Survivors and Disability Insurance program, or by state workmen's compensation laws.

Scholarships and Loans

The report on "Technology and Manpower in the Health Service Industry, 1965-75" also states:

> "Under existing and pending legislation for aid to post high school training in the health professions, the only form of student aid available on a large scale is tuition loans that must be repaid (at least in part). It is widely believed that reliance principally on the loan approach is insufficient. Modifications to provide scholarships to substantial numbers of qualified applicants, at least covering the first year's tuition and living costs, and similar financial incentives, could result in much higher recruitment response without greatly increasing the costs of recruitment programs."

For Schools training Certified Laboratory Assistants, there is no or only nominal tuition, and scholarships or loans are therefore not usually required except for living expenses. In some schools, funds are available from the Manpower Development and Training Act to pay stipends to eligible students in CLA training. According to the 1967 Manpower Report, MDTA projects provided for the training of 691 "medical laboratory assistants" and "medical technicians" between late 1962 and the end of 1966.

Diversification of Appeal of Economic and Sociologic Factors

A difficulty in determining the possible effects of changes in economic and sociological aspects of laboratory careers is the diversification of the audience. Potential recruits vary from persons aged eighteen to middle-age and from the under-privileged high school dropout to the college post-graduate.

The Report on "Supply and Training of Paramedical Personnel," notes that "a good portion of health workers do not enter training for health careers directly from education but two, five, ten and even twenty years later. Yet most recruitment efforts are directed to the graduating high school senior." Others take issue with this statement. Studies made of Science Fair finalists indicated that age 12 is the peak year at which youngsters develop an interest in science -- so some say the ideal time for recruitment to science careers is the junior high school age. And the American Hospital Association, in the August, 1967, issue of its "Cross-Reference on Careers," complains of lack of recruitment effort on college campuses. This article states, in part:

> "Visit a college or university campus from October through April and you will find representatives from business, industry, government, and education talking to students about career opportunities with their organizations.
>
> "Why hospitals and other health agencies haven't taken more advantage of campus recruitment is a moot question. Many jobs in the health field demand either a college or graduate degree... In fact, according to a PHS report, approximately 1,140,000 of the nearly 3,000,000 individuals employed in health services and in related fields in 1965 held jobs requiring college or professional preparation.
>
> "For the health field, campus recruiting can serve a twofold purpose -- direct recruitment for jobs that require only a baccalaureate degree and promotion of health careers that require graduate study."

The Influence of Productivity Gains

It is possible that increased salaries and improved sociological aspects of medical laboratory jobs can be financed by productivity increases from such factors as automation, improved training, and improved manpower utilization. There is little argument that low salaries attract inferior personnel and help account for high turnover, both of which add to the expense of running laboratories.

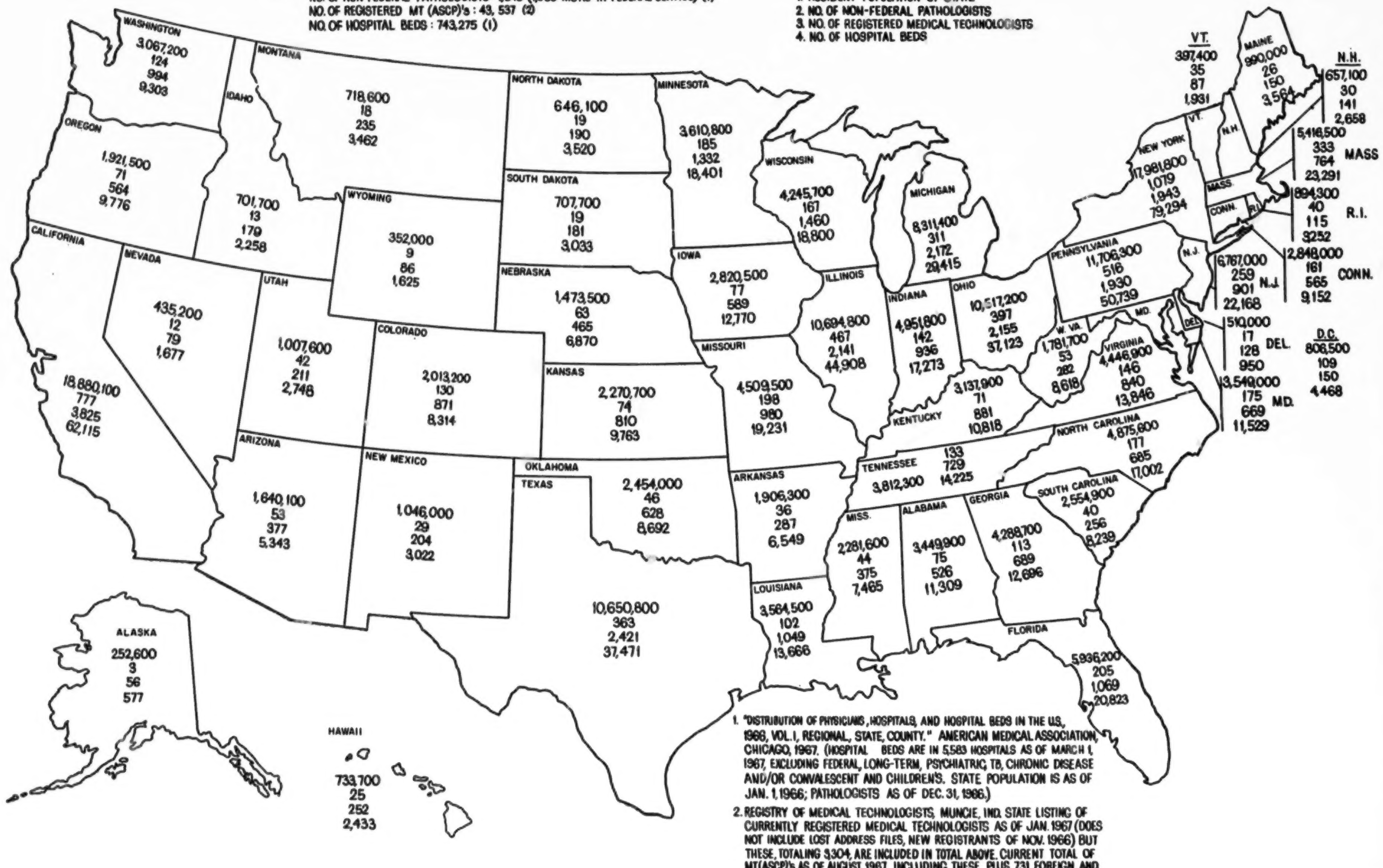
It has been anticipated that automation would achieve productivity increases of four or five times the manpower investment. An article in the Wall Street Journal recently reported that an automatic blood testing and evaluation system from International Business Machines will permit a laboratory technician to perform 50,000 tests a year, 10 times his capacity without the machine. Dr. Arthur E. Rappoport is quoted as saying: "We have two or three technologists doing tests that conservatively would take 13 technologists with old methods." The cost of the system is given as $600 a month rental to IBM. This is considerably cheaper than the cost of salaries of 10 technologists...a generous margin for improving economic and sociological aspects of laboratory employment.

Reinforcing this view is a statement in the 1967 Labor Department Manpower Report that: "The most promising approach to the solution of this (financial) dilemma lies in productivity improvement. Substantial productivity gains mean that fewer workers can provide the same quantity and quality of patient care, so that even with a rise in pay scales a hospital's total wage bill may not be significantly higher than before."

GEOGRAPHIC DISTRIBUTION OF MEDICAL TECHNOLOGISTS, PATHOLOGISTS AND HOSPITAL BEDS - AND POPULATION OF STATES - 1966

TOTALS: U.S. POPULATION : 195,195,000 (1)
NO. OF NON-FEDERAL PATHOLOGISTS: 7,849 (1,065 MORE IN FEDERAL SERVICE) (1)
NO. OF REGISTERED MT (ASCP)'s : 43, 537 (2)
NO. OF HOSPITAL BEDS : 743,275 (1)

KEY: (IN DESCENDING ORDER INDICATED BELOW)
1. RESIDENT POPULATION OF STATE
2. NO. OF NON-FEDERAL PATHOLOGISTS
3. NO. OF REGISTERED MEDICAL TECHNOLOGISTS
4. NO. OF HOSPITAL BEDS


WASHINGTON 3,067,200 124 994 9,303
OREGON 1,921,500 71 564 9,776
CALIFORNIA 18,880,100 777 3,825 62,115
IDAHO 701,700 13 179 2,258
NEVADA 435,200 12 79 1,677
MONTANA 718,600 18 235 3,462
WYOMING 352,000 9 86 1,625
UTAH 1,007,600 42 211 2,748
ARIZONA 1,640,100 53 377 5,343
COLORADO 2,013,200 130 871 8,314
NEW MEXICO 1,046,000 29 204 3,022
NORTH DAKOTA 646,100 19 190 3,520
SOUTH DAKOTA 707,700 19 181 3,033
NEBRASKA 1,473,500 63 465 6,870
KANSAS 2,270,700 74 810 9,763
OKLAHOMA 2,454,000 46 628 8,692
TEXAS 10,650,800 363 2,421 37,471
MINNESOTA 3,610,800 185 1,332 18,401
IOWA 2,820,500 77 589 12,770
MISSOURI 4,509,500 198 980 19,231
ARKANSAS 1,906,300 36 287 6,549
LOUISIANA 3,564,500 102 1,049 13,666
WISCONSIN 4,245,700 167 1,460 18,800
ILLINOIS 10,694,800 467 2,141 44,908
MICHIGAN 8,311,400 311 2,172 29,415
INDIANA 4,951,800 142 936 17,273
OHIO 10,517,200 397 2,155 37,123
KENTUCKY 3,137,900 71 881 10,818
TENNESSEE 3,812,300 133 729 14,225
MISS. 2,281,600 44 375 7,465
ALABAMA 3,449,900 75 526 11,309
GEORGIA 4,288,700 113 689 12,696
FLORIDA 5,936,200 205 1,069 20,823
SOUTH CAROLINA 2,554,900 40 256 8,239
NORTH CAROLINA 4,875,600 177 685 17,002
VIRGINIA 4,446,900 146 840 13,846
W. VA. 1,781,700 53 282 8,618
PENNSYLVANIA 11,706,300 516 1,930 50,739
NEW YORK 17,981,800 1,079 1,943 79,294
VT. 397,400 35 87 1,931
MAINE 990,000 26 150 3,564
N.H. 657,100 30 141 2,658
MASS 5,416,500 333 764 23,291
R.I. 894,300 40 115 3252
CONN. 2,848,000 161 565 9,152
N.J. 6,767,000 259 901 22,168
DEL. 510,000 17 128 950
MD. 3,549,000 175 669 11,529
D.C. 806,500 109 150 4,468
ALASKA 252,600 3 56 577
HAWAII 733,700 25 252 2,433

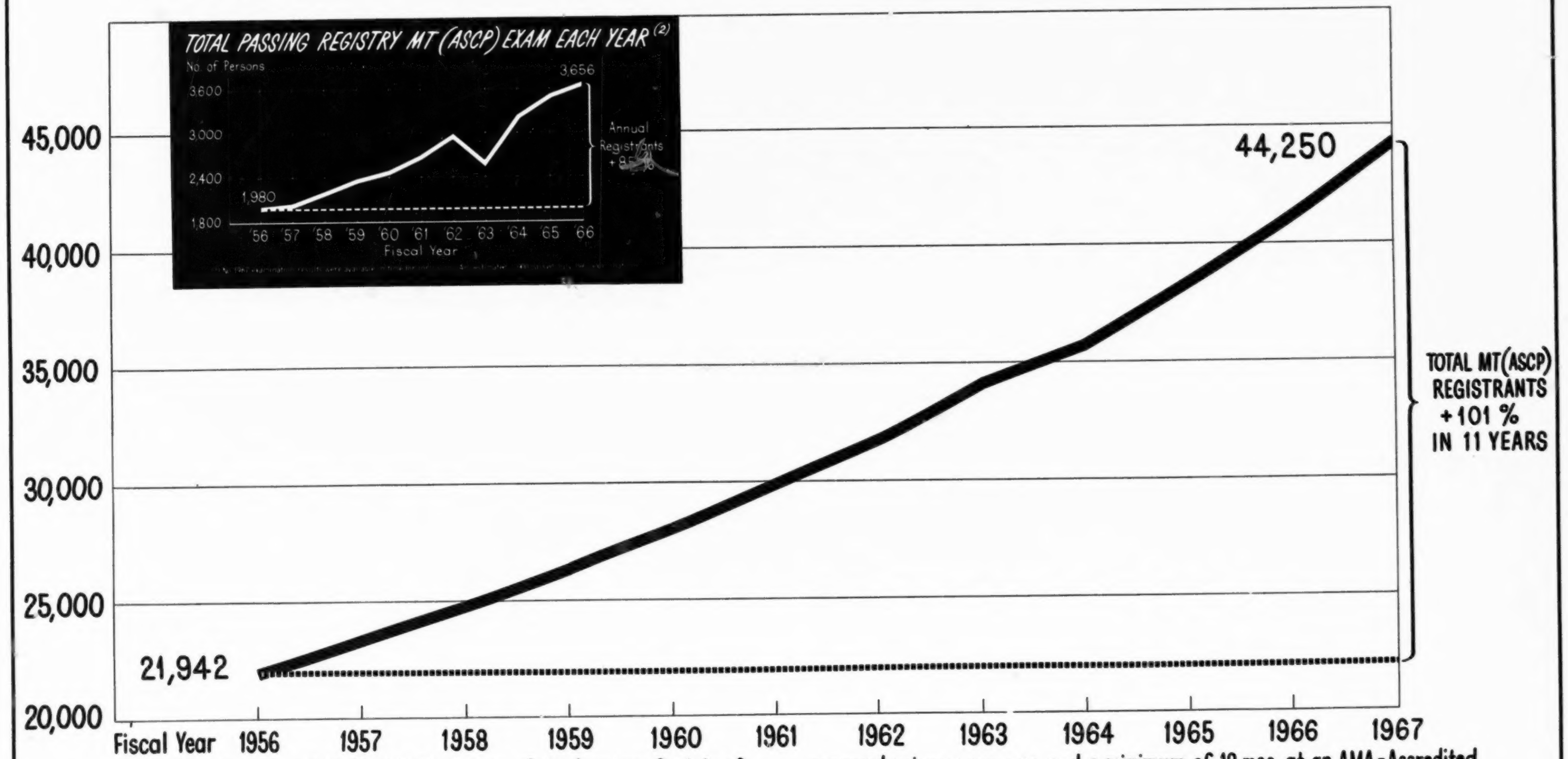
1. "DISTRIBUTION OF PHYSICIANS, HOSPITALS, AND HOSPITAL BEDS IN THE U.S., 1966, VOL. I, REGIONAL, STATE, COUNTY." AMERICAN MEDICAL ASSOCIATION, CHICAGO, 1967. (HOSPITAL BEDS ARE IN 5,583 HOSPITALS AS OF MARCH 1, 1967, EXCLUDING FEDERAL, LONG-TERM, PSYCHIATRIC, TB, CHRONIC DISEASE AND/OR CONVALESCENT AND CHILDREN'S. STATE POPULATION IS AS OF JAN. 1, 1966; PATHOLOGISTS AS OF DEC. 31, 1966.)

2. REGISTRY OF MEDICAL TECHNOLOGISTS, MUNCIE, IND. STATE LISTING OF CURRENTLY REGISTERED MEDICAL TECHNOLOGISTS AS OF JAN. 1967 (DOES NOT INCLUDE LOST ADDRESS FILES, NEW REGISTRANTS OF NOV. 1966) BUT THESE, TOTALING 3,304, ARE INCLUDED IN TOTAL ABOVE. CURRENT TOTAL OF MT(ASCP)'s AS OF AUGUST 1967, INCLUDING THESE, PLUS 731 FOREIGN AND 2,160 CERTIFIED FOLLOWING JULY 1967 EXAMINATION, COMES TO 46,410)

REGISTERED MEDICAL TECHNOLOGIST MT (ASCP)

3 years of college
plus 12 months of professional
education

Cumulative Totals of Currently Registered MT (ASCP)'s - 1956-1967 (1)

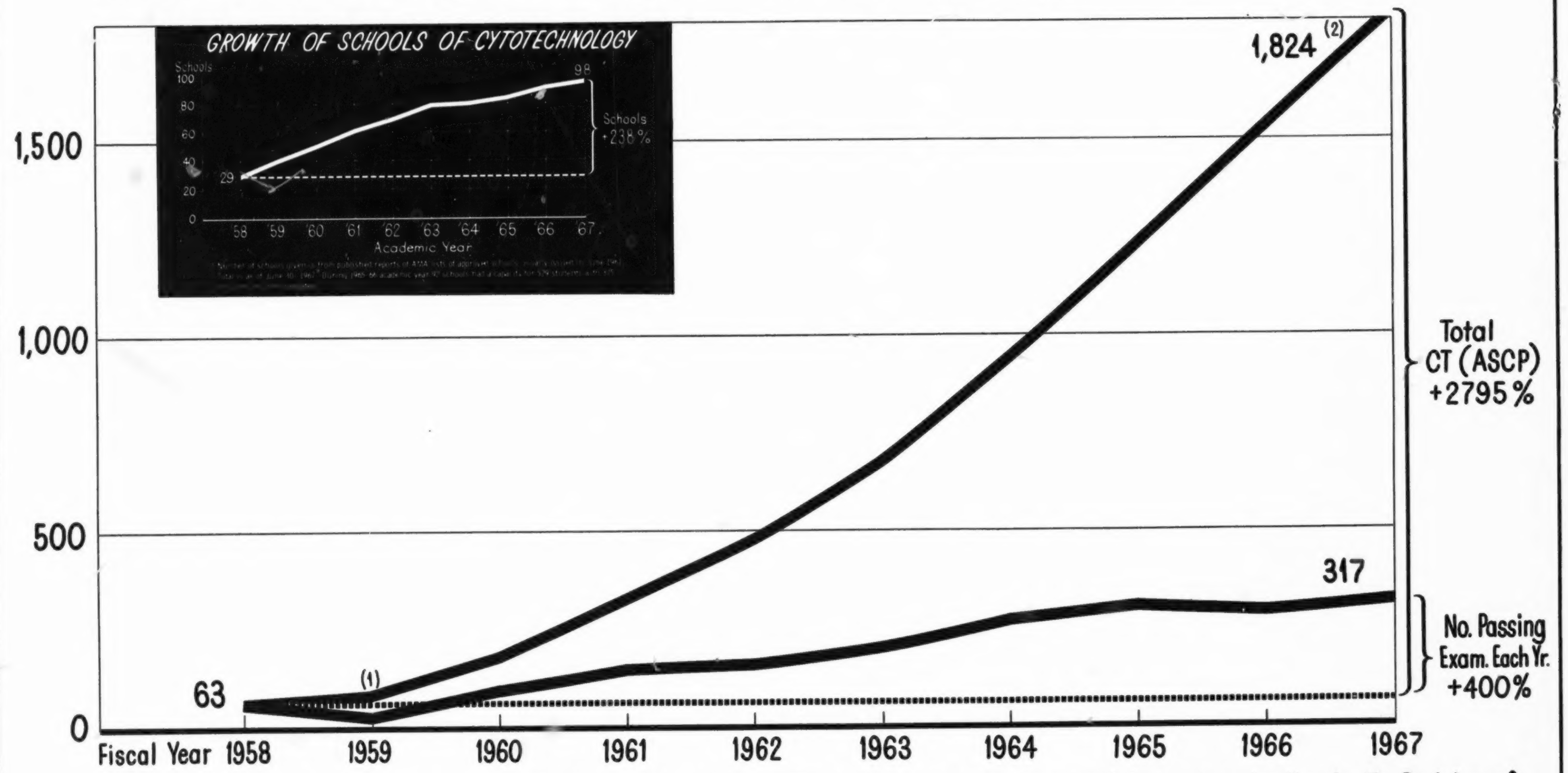


The Board of Registry of Medical Technologists of the American Society of Clinical Pathologists certifies medical technologists by examination, given in July and November. Applicants must have at least 3 years of college with approved science courses and a minimum of 12 mos. at an AMA-Accredited School of Medical Technology or a college science degree plus 5 years laboratory experience under a pathologist and MT (ASCP) supervisor

(1) Annual cumulative totals are given as of June 30, end of specified fiscal year, and therefore do not include July and November examinations of the year listed These are given in the insert.

CYTOTECHNOLOGIST - CT (ASCP)

2 years of college plus
12 months of professional
education



Growth in Certified Cytotechnologists - and in Annual Registrants, 1958 - 1967

Schools of Cytotechnology are approved by the AMA Council on Medical Education, with the ASCP Board of Schools

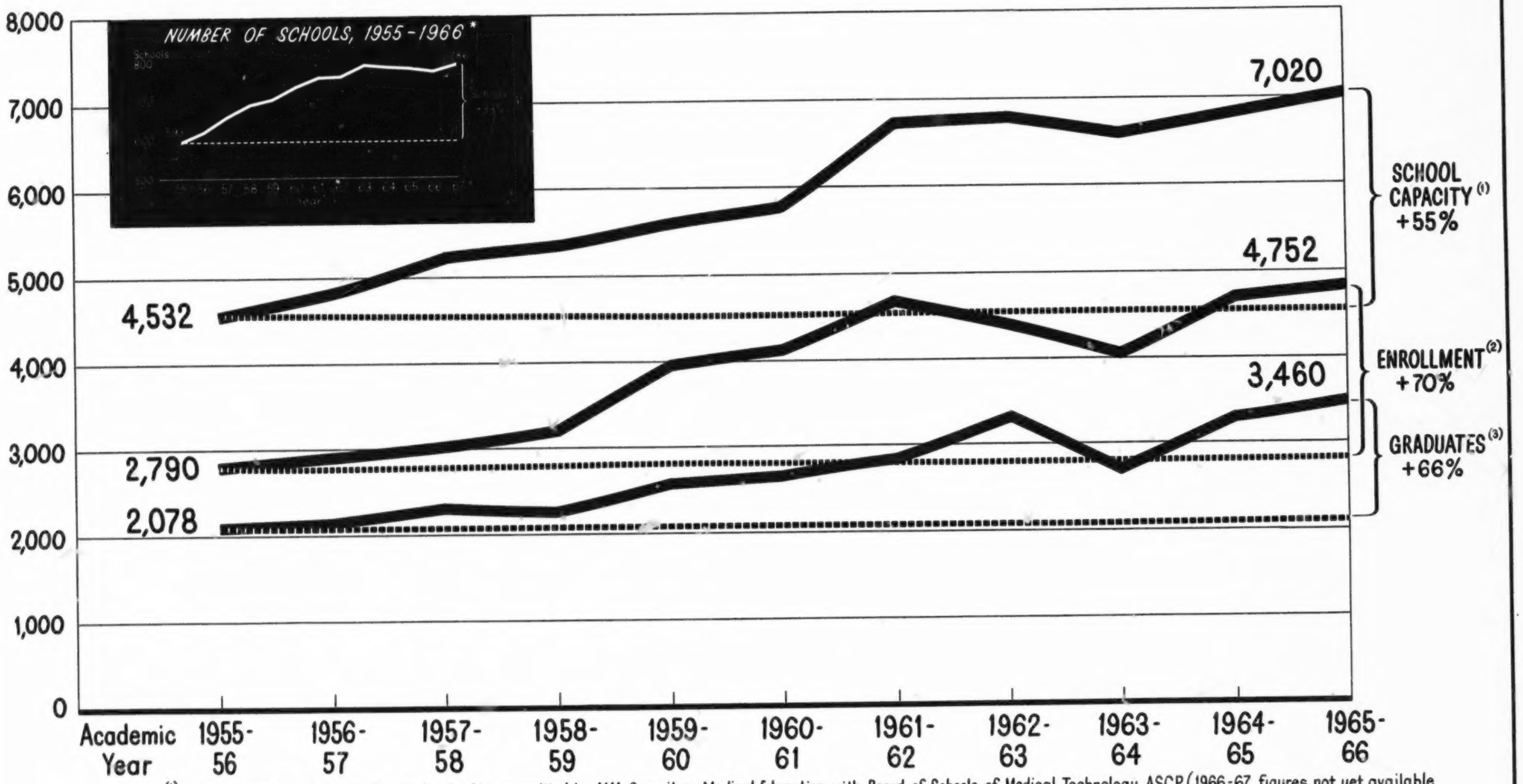
Graduates may take the annual Spring examination by the Registry of Medical Technologists for certification as CT (ASCP)

(1) First examination was given in November 1957, was included in 1958 fiscal year report; second, in May 1958, was not marked in time for 1958 report, so is included in 1959 fiscal year report. Starting in 1959, exams. were given in March; 1960 total includes 1959 and 1960 exams; succeeding years each include March exam of year listed

(2) Although 1824 is number of currently registered CT (ASCP)'s in Board of Registry annual report of June 1967, as of Aug. the running total incl. lost address files came to 2140.

MEDICAL TECHNOLOGY EDUCATION, 1955-1966

Capacity, Enrollment and Graduates of Medical Technology Schools



(1) Capacity-maximum students for which school is accredited by AMA Council on Medical Education, with Board of Schools of Medical Technology ASCP (1966-67 figures not yet available

(2) Enrollment covers academic year, including those already in classes and those admitted during year (more than half the schools have 2 or more classes per year)
Attrition rate in schools is under 5%.

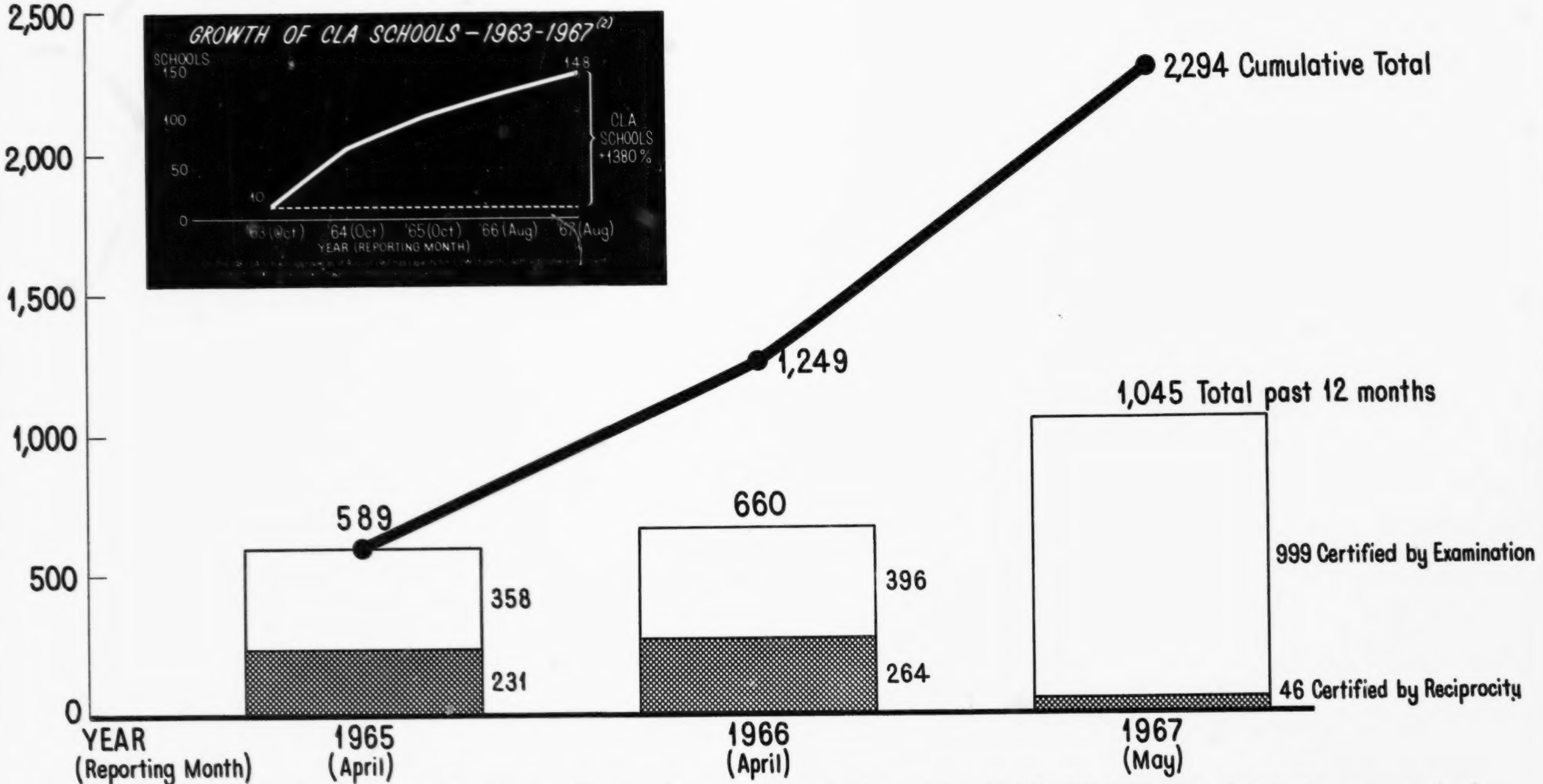
(3) Graduates are those completing program in academic year. Entrance requirements changed January 1962 from 2 years of college to 3 years.

Note: Incomplete figures for 1966-67 showed capacity of 7,187, enrollment of 4,994, and graduates of 3,599

CERTIFIED LABORATORY ASSISTANTS-CLA

High school diploma plus
12 months of training in an
approved school

CLA's-289 Percent Increase in Three Years [1]



Under a program initiated in 1963 by the American Society of Clinical Pathologists and the American Society of Medical Technologists, the Board of Certified Laboratory Assistants approves schools and certifies persons as CLA upon examination or by reciprocity

[1] Certification examination is given each October, with first one in October 1964. Persons are certified by reciprocity because of training on specific levels in the military or in programs previously approved by ASCP and ASMT

FACTORS SHAPING THE FUTURE OF MEDICAL LABORATORY PRACTICE

Medical laboratories are at the center of rapid and virtually all-embracing changes now being experienced in American medicine. The economic, technological, and social forces involved will affect the composition, relationship and functions of the laboratory, as well as the nature and delivery of medical care. Serious attention to these forces will be required of all laboratory personnel, including physicians, if laboratory medicine is to retain its cherished values and its reputation as a major health resource for the benefit of all citizens. Some of the factors shaping the future of medical laboratory practice are: automation, medicare and medicaid, and multiphasic screening.

Automation

Sophistication of test procedures, demand for services, and automation of routine, repetitive laboratory tasks are mutually reinforcing. With current demand patterns, some two dozen procedures account for 80% to 90% of the workload in most laboratories. They are amenable to automation, which in turn vastly increases laboratory capacity and productivity and lowers unit cost. Automation of laboratory procedures can greatly enhance quality and quality control; it can enlarge the service area from locality to metropolis, region or state; it can reduce patient costs to a range of one-fifth to one-tenth those for conventional procedures, depending on volume. Current experience indicates that laboratory volume is expending at the rate of 15% per year or roughly a five-year doubling time. The economies of scale made possible by automation provide a powerful incentive toward centralization of laboratory facilities for the bulk of patient tests, and radical departures from traditional laboratory practice and staffing. As in many other fields, automation will place a rising premium on the highest laboratory skills, and may render many of the lesser ones redundant.

Potentially, the entry of large venture capital into the medical laboratory, increasingly through conglomerate corporations otherwise unrelated to health care, may be the most significant present trend from the point of view of the laboratory-related professions. Such corporations are likely to have a strong competitive position. Lacking effective new initiatives by the professions, the field may become dominated within a decade or so by highly centralized, automated laboratories operated as industrial subsidiaries.

In a new form, this is merely an extension of a trend toward the private control of laboratories, though until now control has been exercised chiefly by pathologists and hospitals. Automation encourages this trend by reducing unit costs on high volume and enhancing the profit potential of large investments. A contributing factor has been the need of hospitals to help underwrite rising deficits on patient care by imposing high, non-competitive laboratory charges, thus raising the ceiling below which others might profitably compete. In this situation many of the traditional private laboratories organized and controlled by pathologists have successfully contracted in recent years to provide all determinations for many small hospitals in their areas.

The newer type of entrepreneurial laboratory, however, poses a much more fundamental question: To what extent is laboratory medicine to be subject to professional control and motivated by professional requirements? Also to what extent are pathologists and medical technologists to become salaried employees of corporate subsidiaries?

Medicare and Medicaid

Demand for non-hospital laboratory services will be stimulated in two ways through the Social Security Amendments of 1965.

In contrast to the provisions of Blue Cross and commercial insurance programs, the Amendments enable reimbursement for outpatient services to large numbers of elderly and low income persons who are not covered by Blue Shield or other programs. The inhibiting prerequisite of hospitalization which formerly separated them from laboratory diagnostic procedures no longer applies to these patients, who are often those most in need of them.

Both private laboratories and non-profit laboratories associated with ambulatory care centers will benefit as diagnostic testing is adopted as standard procedure among family physicians and as community health facilities are extended to segments of the population they do not presently reach.

Furthermore, the Amendments require increasingly strict cost accounting and reporting of true costs. Consequently, as cost reimbursement under Titles XVIII and XIX represents a larger proportion of hospital budgets, the underwriting advantage of hospital laboratory operation will diminish. In view of laboratory manpower difficulties experienced by most hospitals, outside contracting for laboratory services may become more common among even the larger institutions.

Multiphasic Screening

The present state of laboratory automation permits rapid screening of populations through a phased, self-auditing battery of 20 to 40 biochemical and physiological determinations. Supplementary procedures include automated medical history transcribers, capable of engaging in dialogue and "branching" from interview routine to explore medically interesting matters revealed by the interviewee. They also provide for "data bank" accumulation of patient profiles.

Data bank information in turn may be compiled for statistical correlations among large populations, or may be assembled in individual patient profiles for comparing patients periodically against their own norms. All of these developments promise very significant advances in patient care and in determining the nature of disease and its control. They also demand very significant improvements in the numbers, types and quality of laboratory workers and in the organization of their work.

Properly managed multiphasic screening is inexpensive, accurate and effective. It has been estimated that an automated multiphasic unit equipped to service 50,000 to 100,000 patients annually, could be operational within two years at a cost of half a million or less including rental of computer and plant. Depending on volume the annual cost per patient would range from $15 to $30 including operating overhead, physician interpretation of tests, correlation of data generated, and amortization of capital investment in about five years. On a citywide scale, a system is now being planned abroad, to serve an urban population of 3 million at a projected cost of $5 per patient (including screening, automated patient history, visual and audial information storage, retrieval and transmission) at a remarkably rapid rate. The economics of innovations like this would reverse the traditional roles of health center and medical laboratory, and could extend comprehensive laboratory analyses to the entire population both as periodic screening and in episodic diagnosis. If such multiphasic screening were extended to most Americans, annual gross expenditures might be on the order of $4 billion.

Adaptation of these techniques to large populations would materially affect health manpower priorities. The most dramatic impact may be the identification of unexpected disease prevalence -- i.e., "hidden demand" of considerable proportion. For example, a recent limited pilot study of mass blood chemistry screening in the Varmland district of Sweden (a relatively healthy population) showed a 10% incidence of clinically significant, previously unknown chemical changes. The early Permanente Group multiphasic program identified referrable conditions in one of every six participating longshoremen. Episodic screening of children in poverty areas indicates previously unknown or mismanaged conditions in at least one of every three.

Within a few years the data bank in the Kaiser-Permanente multiphasic unit will offer valuable information on costs, benefits and procedures. By that time units of the Public Health Service also expect to have accumulated sufficient background data and expertise to offer comprehensive multiphasic consultation on design of facilities and laboratories, data processing, demography, and economic and cultural factors in addition to manpower considerations. The "Preventicare" bill now before Congress would offer a systematic means of health management for a majority of citizens, through mass screening operations. If these objectives materialize, pressures for comprehensive medical attention will become intense. Already some four dozen partially automated screening units are being run for limited groups by industrial firms, labor unions and public health departments. As this movement matures, there will be severe competition for highly skilled laboratory workers; partly because of expansion of diagnostic services, and partly because of increased demand in other health occupations for the same kinds of skills.

Health Hazard Appraisal

Another development is the use of information obtained in mass screening to assist the physician in establishing individual health hazard appraisals for his patients. These are prognostic surveys combining patient and family history, examination and special diagnostic procedures conducted with particular reference to the top fifteen causes of death on an age-, race-, sex-, and other-specific basis. By aligning definable health hazards with individual profiles, preventive routines may be established to extend useful life expectancies.

A pilot health hazard appraisal program is now under way at Methodist Hospital in Indianapolis and at Jefferson Medical College. Another will soon commence in conjunction with a multiphasic screening unit in the Public Health Service Hospital on Staten Island. Preliminary evaluation suggests that similar programs may become important facets of modern health management throughout the nation.

Recent Legislation

The Heart Disease, Cancer and Stroke Amendments of 1965 authorize Federal support of regional medical complexes designed to co-ordinate health resources relating to education, research and delivery of care throughout major geographic areas. These Amendments are supplemented and amplified in the Comprehensive Health Planning Amendments of 1966, which support state planning activities for comprehensive deployment of health facilities, manpower and care.

Optimum utilization of laboratory techniques and automation already available should achieve productivity increases on the order of four or five times the manpower investment. If present expectations of earlier detection and better control of disease materialize, some health management pressures may shift from scarce and expensive workers to those more quickly and cheaply trained. However, the traditional result of technological innovation has been an ultimate overall increase in manpower demand, both quantitatively and qualitatively. From all appearances, innovation in medical laboratories will not provide an exception to this general pattern. Laboratories of the future will undoubtedly draw upon a wide array of disciplines -- physics, system analysis, engineering, economics, mathematics and computer specialties in addition to basic medical sciences -- and will incorporate a number of functional levels, from electronics trouble shooter to pathologist, in an integrated team relationship.

As a cursory examination of these various tendencies suggests, the change already in process and still to come is impelled by strong economic, sociological, technological and political forces. Change itself -- even drastic change -- is no doubt inevitable. Right now those who are guiding laboratory medicine are being confronted with the same problems that beset the independent grocery store owner a few decades ago. Just as machines that mass-produced groceries brought on chain store distribution, so machines that mass produce tests are leading to the corporate enterprise of laboratory medicine. But it might be argued that human lives are not exactly in the same category as groceries.

Within the foreseeable future there will be a choice: Whether clinical laboratories will be operated as an enterprise of large unrelated corporations, or as a health resource to be allocated as broadly as possible by professional and public training groups. Will the primary objective in the laboratory healing arts be maximization of business profits, or of public contact? When this decision is clear, so too will the goals of medical laboratory education and manpower development be clarified.

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6. W. B. Stewart, M.D., in communication to Peter S. Bing, M.D., executive director, National Advisory Commission on Health Manpower.
7. "Medical Technologist Workload in Relation to Specific Diseases, GIST #3, August 1958, page 2.
8. Report by Frances Wideman, MT(ASCP), to Alabama State Society of Medical Technologists, May 14, 1960.
9. Both quoted in "The Hospital People," A Report by Blue Cross, Vol. XXI, No. 1, 1967, page 44.
10. Testimony by David Sencer, M.D., NCDC Director, before Senate Antitrust Subcommittee February 6, 1967.
11. Report by William Reich, executive secretary, AAB to conference of State Public Health Laboratory Directors, October 1966.
12. HOSPITALS, J.A.H.A., August 1, 1966, page 466; August 1, 1967, page 470.
13. "Education for the Allied Health Professions and Services." Report of the Allied Health Professions Education Subcommittee of the National Advisory Health Council. PHS Publication No. 1600. Public Health Service, U.S. Department of Health, Education, and Welfare, 1967, page 9.
14. Based on survey report published in GIST #36, April 1967. Survey showed 65.2% worked in medical technology in 1966, plus 7.4% who worked occasionally. About 57.4% worked 30 or more hours a week.
15. Earle H. Spaulding, Ph.D., chairman, Department of Microbiology, Temple University School of Medicine, personal communication, July 31, 1967.
16. Kurt M. Dubowski, Ph.D., Professor of biochemistry, medicine and pathology, University of Oklahoma Medical Center, personal communication. August 1, 1967.
17. "The Need for Bio-Medical Equipment Technicians," from Preliminary Partial Report on Phase I, Research Program. Technical Education Research Center, Cambridge, Massachusetts, 1966 (mimeographed). Appendix I, page 1.

FUTURE NEEDS FOR MEDICAL LABORATORY PERSONNEL

Introduction

Assessments of present supply of medical laboratory personnel in at least five recent major studies, most of them including projections of future needs, vary substantially, pointing up the pitfalls of this manpower "numbers game." Such projections depend on the base used in determining present supply, on the standards used in describing categories of personnel, on the assumptions underlying estimates of future need, and even on semantic definitions of "shortages" and "needs."

What is a shortage? Employment Service Review, published by the U.S. Employment Service, says:

> "Many pitfalls exist in making manpower estimates in the health service field. For example, the Public Health Service estimate of current shortages of registered nurses is 125,000. The Employment Service estimate of need, based on an April 1966 job vacancy survey, comes to only 35,000.
>
> "The Public Health Service bases its estimate of shortage on such an established criterion as levels of 'safe and therapeutic services,' which, in turn, is dependent upon a desirable level of medical care and hospital facilities. The latter may not be in even the planning stage, let alone have vacant work stations. The Employment Service estimate is based on unfilled jobs for which there are current vacant work stations and for which the employer is actively recruiting.
>
> "With respect to distinguishing between 'need' and 'shortage,' a need for workers does not necessarily imply that the workers cannot be recruited. Specifically, the Employment Service considers as 'shortage' those hard-to-fill jobs which remain vacant for a month or more despite vigorous recruitment effort..."
>
> (underlining denotes italics in original)

Although the numbers may not agree, most who have studied the medical laboratory picture in depth agree that there are not enough adequately trained personnel at all levels to enable medical laboratories to operate efficiently and effectively -- and that there will not be enough to meet needs of laboratories in 1975 at the current rate of education and training.

Even if everyone did agree on numbers, however, these would probably be outdated before we approached the target date, as new instruments, techniques and patterns of service continue to change both the numbers and the types of personnel needed. Predictions of future need must take into consideration many factors: the growing complexity of laboratory work, the increased use of diagnostic tests, the emphasis on well-qualified personnel, the impact of technological changes and automation, the application of data processing, the increased utilization of facilities through Medicare, regional programs, multiphasic screening, etc.

Laboratory Workload

Predictions of laboratory workloads usually start with a base of at least a half-billion clinical diagnostic tests performed in 1966. Projections that this will double by 1975 to at least a billion have been called conservative. The workload in clinical chemistry laboratories has doubled approximately every five years during the past two decades (average increase in tests of 15 percent per year), and this rate of growth is expected to continue.

In the next 10-15 years, automation is expected to triple or quadruple the capacity of laboratories in general hospitals. However, while automation will bring about increased efficiency per technician hour, most observers agree that these gains usually are offset by requests for a larger quantity of work, resulting in increases in manpower needs.

In fact, the special difficulty in forecasting laboratory needs has been ascribed by one pathologist to the "exponential factor reflecting increased demands for laboratory work." He points out that while productivity of the individual worker should increase with adequate application of modern techniques of automation and data processing, "there is a very great tendency to add new tests in the clinical laboratory and only rarely to drop previously used tests of proven value. This phenomenon will, of course, increase the number of individuals needed by a factor I am completely unable to predict."

The medical technologist's workload in relation to certain diseases was analyzed in a 1958 study in Washington, D.C. hospitals, giving the variety of tests and the average number done per patient. Some of the results of that study are given below:

Disease	Variety of Tests	Tests per patient (average)
Arthritis and metabolic diseases	33	9.7
Cancer	40	22.5
Cardiovascular	50	19.6
Cerebral palsy	19	40.1
Diabetes	23	127.2
Tuberculosis	51	50.

Today, the choice of tests is much greater as new techniques have been introduced accompanied by increasing sophistication in the application and interpretation of the older procedures. Nearly a decade ago, a study in Birmingham, Alabama revealed that some 250 new procedures or modifications of old ones were introduced every year. More recently, a Los Angeles technologist estimated that her laboratory now does 50-75 tests that were not in existence ten years ago, and a Chicago microbiology technologist noted that the number of bacterial cultures in her laboratory rose from 19,000 to about 30,000 in the past decade, and that serology tests, excluding those for syphilis, almost tripled in that time, from 5,000 to 14,000, mostly in new procedures.

How Many Laboratories?

There are widely varying estimates on how many clinical laboratories there are in the country. The National Communicable Disease Center has estimated that there are 7,000 clinical laboratories in hospitals, 400 in State and local public health departments, and 5,600 to 6,600 operated independently -- making a total of 13,000 to 14,000 -- plus an untabulated number of non-pathologist physicians who perform a significant number of tests in their own offices and clinics. The American Association of Bioanalysts in 1966 estimated that this latter category might range anywhere from 13,000 to 40,000. The American Academy of General Practice which has 25,614 members, reported in 1966 that some 97% of general practitioners do some laboratory procedures in their offices.

The 1966 Guide issue of Hospitals, reporting results of the American Hospital Association's 1965 survey of registered hospitals, stated that 6,204 hospitals -- 96.6% of those responding -- had clinical laboratories. This category is not included in the 1967 Guide Issue, but is probably at least the same percentage. The 1967 survey lists 3,836 pathology laboratories, or 57.6% of the 6,660 hospitals reporting. (These are laboratories "in which tissue specimens are examined by a qualified pathologist.")

On the next pages are summaries of recent reports and studies which estimate current supply of health manpower, including medical laboratory personnel, and most make some projections for the future. These estimates are then analyzed in a summary section, together with the latest data on education and information on other categories of laboratory personnel, in an attempt at pinpointing more closely the needs of laboratory personnel for 1975.

1. Health Resources Statistics: Health Manpower, 1965, National Center for Health Stat-

istics, Public Health Service, U.S. Department of Health, Education, and Welfare. PHS Publication No. 1509. 1967 (Prepared by Maryland Pennell).

Under "Clinical Laboratory Services," this report states that "upwards of 85,000 persons in a wide variety of occupations are engaged in providing services within the clinical laboratory setting, in addition to the physicians." Projection of a 1958 hospital survey, the report notes, "would indicate that between 45,000 and 50,000 laboratory personnel were employed in about 6,500 to 7,000 hospitals. Another 25,000 to 30,000 persons (other than nurses) perform some laboratory work in physicians' offices. Perhaps as many as 10,000 persons work in 2,000 or so private independent laboratories... Nearly 4,000 laboratory workers are reported as employed by State and local health departments. A smaller number probably work for industry and independent research organizations.

Breaking down the totals by categories, this study counts about 3,500 or more professional scientists with graduate degrees in chemistry or the biological sciences (including about 1,600 clinical chemists and perhaps an equal number of microbiologists); between 2-3,000 college graduates with a major other than medical technology; about 32,000 MT(ASCP)s; and "probably in excess of 45,000 individuals with varying combinations of experience and post high school training ... engaged in various types of clinical laboratory work" (including nearly 1,500 cytotechnologists with formal training and 1,500 trained on the job; about 2,500 histologic technicians in clinical laboratories and "quite a few more ... in research and other laboratory situations"; and 1,080 CLAs, with no breakdowns attempted for the additional 38,400-odd in this grouping). No future projections are given.

II. Technology and Manpower in the Health Service Industry, 1965-1975, Manpower Administration, U.S. Department of Labor, 1966. (Prepared by Herman M. Sturm).

The "health service industry" as described here, includes private and government-owned hospitals and nursing homes, offices and clinics of private medical and other individual practitioners and groups, and privately operated laboratories. Employment of medical laboratory personnel in these areas, in full-time equivalent terms, and excluding physicians, is given as:

1965	1970	1975
100,000	130,000	160,000

Of the 100,000 estimated for 1965, the report breaks them down into approximately 80,000 in hospitals and 20,000 in laboratories, private offices, etc. Types of workers are given approximately as follows:

Medical technologists, technicians, scientists:	60,000 (55,000 in hospitals)
Laboratory assistants (certified, semi-skilled):	25,000 (15,000 in hospitals)
Laboratory helpers, orderlies, etc.:	15,000 (10,000 in hospitals)

This study also estimates that there are 27,000 additional medical laboratory personnel working outside the health service industry (schools, outpatient health centers of government agencies, etc.) This would make a total of 127,000 for 1965. (Although this total is not projected to 1975, if the 60% estimated increase noted above -- from 100,000 to 160,000 -- also represented the rate of increase for these 27,000 it would make a total of some 43,200 additional workers in 1975 outside the health service industry -- for a grand total of about 203,200.)

The basis for future projections in this report are effects of expectations regarding growth and change -- demand for health services, productivity and technology. Expectations were based "partly on statistical evidence, partly on factual data, somewhat on subjective judgments."

The study focuses on effects of technological advances, but also refers to effects of existing shortages on quality of health care. Relevant quotations from the report:

> "The greatest expansion in number of jobs in the decade ahead will probably involve the X-ray and clinical laboratory departments. Jobs in these areas are likely to expand twice as fast as jobs for health service employees in general, mainly because of the sharp increases in use of X-ray techniques and clinical laboratory testing during the next ten years. Rising demands for employees in these departments will be only partly offset by the spread of automated laboratory equipment and improved X-ray equipment ...
>
> "Since the general effect of innovations in the health field is primarily to raise the quality of health care, they tend on the whole to increase the demand for manpower trained in new skills rather than reduce the demand for labor. They not only create new kinds of jobs, but broaden existing jobs by requiring them to incorporate new skills. The computer is an example of an innovation that will have several effects: Broadening the jobs of laboratory workers, nurses and others; bringing a new category of electronic data specialists into hospitals ..."

III. Health Manpower, 1966-1975: A Study of Requirements and Training Needs, Division of Manpower and Occupational Outlook, Bureau of Labor Statistics, U.S. Department of Labor, 1967 (Prepared by Neal H. Rosenthal).

This report concentrates on 14 health occupations representing 2.5 million of the estimated 3 million employed in the health occupations in 1966. Effective demand for workers in 1975 was developed under a specific set of assumptions, such as population growth, health care expenditures, rate of technological advances, etc., rather than on needs to provide a specific standard of medical care (which is the basis for estimates of the Bureau of Health Manpower of the Public Health Service, see Part V).

The report states that manpower requirements are expected to increase from about 40,000 medical technologists in 1966 to 75,000 in 1975. In addition to the growth need for 35,000 indicated here, an additional 15,000 will be needed to replace workers who may die, retire or leave the work force for other reasons. This makes a total need for about 50,000 new technologists who would have to graduate between now and 1975, an annual average of about 5,500 graduates. In 1966, the report points out, the AMA-Accredited Schools of Medical Technology provided 3,460 graduates; to meet the projected needs, the average annual number of graduates between now and 1975 must be increased by at least 2,000. Noting that the schools currently are filled only to about two-thirds of capacity, the report concludes that additional students must be attracted to the schools to meet these future needs.

About 50,000 medical laboratory assistants were employed in 1966, the report estimates, including in this category workers with 1-2 years of post high school training or the equivalent in experience (cytotechnologists, histologic technicians or other laboratory personnel at this level are not included specifically in the report's totals). Employment requirements for this group are expected to increase to about 100,000 by 1975. In addition to these growth needs of 50,000 are replacement needs of about 20,000, totaling 70,000 new laboratory assistants who will have to complete training by 1975.

The report points out that many in this category have been trained on the job, but that an increasing number are being trained in academic programs (Certified Laboratory Assistant programs). The basic need here, the report stresses, is primarily to develop more hospital schools training in this field and to attract more young people to this career opportunity.

IV. Manpower Resources in Hospitals -- 1966, Summary Report of a Survey Conducted by the Bureau of Health Manpower, Public Health Service, Department of Health, Education, and Welfare, and the American Hospital Association. American Hospital Association, 1967.

This publication summarizes the statistical findings of a broad-scale hospital personnel survey undertaken in 1966 by PHS and AHA. Based on these figures, future reports and extrapolations are planned. The first, "Health Manpower Perspective, 1967," is in press now. A preview of its contents is given in Part V.

The summary report presents data on staffing and current needs for hospitals in the country as a whole, for each region and each state, together with data on "Most Urgent Personnel Needs" (Medical technologists were fourth on a list of five categories cited by hospitals under this heading). Responses were received from 4,369 out of the 6,993 hospitals registered by AHA, and figures given by the reporting hospitals were projected for all hospitals in estimates by PHS. The table below shows present staff for diagnostic services as indicated by reporting hospitals and in the PHS projections for all hospitals. Additional needs represent the sum of budgeted vacancies and additional personnel needed to provide optimum care as of the reporting week (April 1966).

	Present Staff		Additional Needs (April 1966)	
	All Hospitals	Reporting Hospitals	All Hospitals	Reporting Hospitals
Medical Technologist	54,488	44,537	9,172 (+17%)	7,487
Laboratory Assistant	14,623	11,883	2,492 (+17%)	2,006
Cytotechnologist	1,634	1,343	539 (+31%)	449
Histologic Technician	3,907	3,243	678 (+18%)	566
EKG Technician	5,932	4,901	823 (+14%)	679
(our totals)	80,584	65,907	13,704	11,187

(The survey form asked for "Medical technologists -- ASCP registered," "Medical technologists -- other registration or certification," and "Other medical technologists (technicians)." However, in the final tabulations, these are all lumped together under the heading "medical technologist," thus providing no breakdown of the qualifications of the personnel included. Similarly, although other categories were specified in the survey form as to registration, the general title alone is used in tabulations.)

The AHA summary report does not include a second category of needs requested in the survey form, that of total needs a year later (April 1967). These figures were included in a preliminary table in HOSPITALS, June 1, 1967, covering just reporting hospitals, and estimated a need in April 1967 for 12,184 medical technologists (27.4% increase); 3,764 laboratory assistants (31.7% increase) 903 cytotechnologists (67.2% increase); 1,045 histologic technicians (32.2% increase), and 1,377 EKG technicians (28.1% increase).

V. Health Manpower Perspective: 1967, Bureau of Health Manpower, Public Health Service, U.S. Department of Health, Education, and Welfare. (In Press.) Prepared by Margaret D. West.

This report, still in press, analyzes in detail the present supply and future demand for health manpower, discusses education and Federal aid for educational programs in the health fields, and examines ways to increase the supply of personnel, innovations in education and training, utilization, working conditions and pay, and program planning and development.

Some tables resulting from the PHS-AHA study (see IV) are included, but two different projections are made of 1975 needs. One estimates the need for health manpower primarily as "perceived by professional groups" (specific groups not identified). This "professional judgment" estimates a need for 70,000 medical technologists in 1975, fairly close to the BLS projection (see III). The second projection is based on the level of needs in the part of the country with the highest proportion of health manpower to population, and the ratio needed to bring the rest of the country up to this level in terms of 1975 needs. On this basis, the medical technology projection drops to 52,400, a predictable result since the "highest region" is the New England-Northeast, where the ratio of medical technologists is lower than the national ratio and substantially lower than almost every other section of the country.*

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*A table in the Bureau of Health Manpower's "Education for the Allied Health Professions and Services," gives the MT(ASCP)s per 100,000 population:

United States	19.2	West North Central	26.7
New England	15.7	Pacific	21.3
Middle Atlantic	12.6		

Included in this publication will be the table of additional needs for 1966 given in the PHS-AHA survey summary (rounded out), with the percent increase, but with the AHA estimated total needs for 1975 added. The latter figures are based on present staff, additional needs and expected increase in hospital beds. The table follows:

	Present Staff	Additional Needed '66	Percent	Estimated for 1975
Medical Technologist	54,500	9,200	17	81,500
Laboratory Assistant	14,600	2,500	17	21,900
Cytotechnologist	1,600	500	31	2,700
Histologic Technologist	3,900	700	18	5,900
EKG Technician	5,900	800	14	8,600
			(our total) -	120,600

(As noted in Part IV, "medical technologists" here includes non-MT(ASCP)s. Also, these totals are only for hospitals.)

VI. Industry Wage Survey, Hospitals - July 1966, Bulletin No. 1553, Bureau of Labor Statistics, U.S. Department of Labor, June 1967. (Prepared by George Stelluto)

Although this statistical analysis is primarily on wages and no future projections are made, it contributes some helpful facts to clarify the picture of hospital employment of professional medical technologists. The report is based on a study of 1,218 private and State and local government hospitals pro-rated to cover the 7,468 hospitals in the country (excluding Alaska and Hawaii). Medical technologist is defined as a person performing "duties normally requiring 12 months' training in an approved school for medical technologists following at least three years of college," thus providing a breakdown not available in the PHS-AH tabulation. Other categories of laboratory workers are not included. The medical technologist breakdown is as follows:

Non-government hospitals	Full-time	18,500	Part-time	4,500
State and local government hospitals	Full-time	6,100	Part-time	800
		24,600		5,300
		5,300		
	Total.........	29,900 working medical technologists		

This total of 29,900 medical technologists working in hospitals in 1966, with 24,600 working full-time, is not too far off from estimates based on NCCMT's 1966 survey of registered MT(ASCP)s. That survey indicated that 72.6 per cent of currently registered technologists were active (worked either full or part-time or occasionally in 1966). This would be about 32,126 out of the 44,250 registrants in 1966 (before the July 1967 examination) -- including those working outside of hospitals. The survey also indicated that 57.4 per cent worked full-time -- which would come to about 25,400. (In one other statistic, however, the BLS survey showed one-third of those working were men, while NCCMT's survey came up with only 11.3 per cent.)

Scientists in the Laboratory

None of these studies gives specific tallies for scientists at different levels in the laboratory, and it is difficult to find accurate figures. A leading microbiologist, for example, states that he has "never been able to obtain reliable figures on the number of people at the Bachelor's level engaged in diagnostic and clinical microbiology... Many individuals are in hematology, chemistry and microbiology rather than microbiology alone."

Somewhat more precise figures have been estimated for clinical chemists. An officer of the American Board of Clinical Chemistry indicates that "very recent knowledgeable estimates (e.g., that by the Office of Professional Relations of the American Chemical Society based on National Science Foundation data and appearing in the Chemical and Engineering News issue of June 19, 1967) placed the number of clinical chemists professionally active in the United States at 1,300 to 1,600. The number of clinical chemistry technologists is more difficult to ascertain, but it is believed to be approximately 6,500 to 8,500."

Projections of Medical Technology Graduates

Estimates of future needs for the medical laboratory necessarily must revolve around securing an adequate number of well-trained persons to fill the pivotal posts of medical technologists.

Medical technology schools graduated 3,283 students in 1964-65, 3,460 in 1965-66, and more than 3,600 in 1966-67 (total as of August 1967 was 3,599 with some 32 schools unreported). At this rate of about 5 per cent per year, there would be a graduating class of about 5,368 in 1975. In the total period from 1967 to 1975, some 40,000 new students would have graduated.

Adding these to the 46,410 currently registered makes a total of 86,410. Subtract from them an estimated 6,300 (based on an average of about 700 who do not renew their certifications or are withdrawn by the Registry each year for death, retirement, etc.) -- and we get 80,110.

If the same ratio of 72.6 per cent of currently registered technologists who are active in the field still holds true in 1975 (see VI above), about 56,216 would be active -- but only about 46,000 of these would be working full-time (using 57.4 per cent figure from NCCMT's 1966 survey).

Conclusions

Merely at current rates of growth, including turnover and dropouts, therefore, only about 46,000 full-time medical technologists would be available for the medical laboratories of 1975. Contrasted with this potential supply, the Bureau of Health Manpower projects a need based on "professional judgments" for 70,000, and the Bureau of Labor Statistics estimates 75,000 technologists.

It can only be a matter of conjecture as to whether these figures reflect adequately the future impact of technological change and automation, the increased productivity per worker, the regionalization and centralization of laboratories, the growing need of specialists and persons trained in new types of technology, electronics, instrumentation, bio-medical engineering, etc.

Another area of future need will be medical technologist educators -- probably numbering about 1,000 today -- who will be in increasing demand with the impact of the Allied Health Professions Personnel Training Act and the initiation of integrated academic programs in universities. They will be needed to teach and to coordinate curricula in junior and four-year colleges and universities and in allied health professions schools, as well as in the professional education programs at all levels.

New categories of technologist specialties are developing as well -- blood banking, chemistry, microbiology and cytology technologists, and specialists with graduate degrees who are certified by the Registry of Medical Technologists. The comparatively new category of nuclear medical technologist can be expected to expand to work in the radioisotope laboratories -- now numbering about 2,000 across the country.

The role of clinical chemists, clinical chemistry technologists and microbiologists also must be considered in future laboratory estimates. The American Chemical Society is considering possible establishment of uniform training programs for B.S. and M.S. degree chemists in the clinical laboratory field and formation of the new National Registry in Clinical Chemistry for B.S. Chemists indicates formalization of this field. The National Registry of Microbiologists recognizes B.S. persons as Registered Microbiologists -- and the American Board of Microbiology is formulating an M.S. program of recognition at an intermediate M.S. level.

At a lower echelon, the Bureau of Labor Statistics has projected a need for 100,000 medical laboratory assistants by 1975. This would conceivably include a substantial number of persons with other than the Certified Laboratory Assistant training: Histologic technicians with their supervised training in a pathology laboratory at one end, and junior college associate degree students at the other, possibly forming an intermediate technician category. It is also possible that this level would face a higher turnover rate, principally because assistants would be encouraged to utilize college study, continuing and in-service education, equivalency testing and similar methods to advance to more responsible positions in the laboratory.

A separate category would be the cytotechnologist, requiring two years of college and a year of professional education -- thus coming between the medical technologist and the laboratory assistant. There are about 2,000 CT(ASCP)s today, plus possibly about that many without AMA-Approved School training. Pathologist studies have indicated a need for as many as 1,000 more cytotechnologists a year to screen cervical smears of the 40-60 million women in the high-risk age group over 21, as well as to screen slides from other sites to seek early warning signals of cancer.

The new special technology occupations represent a comparative unknown. Some are being developed in efforts to meet the physician shortage, such as physician's assistants or autopsy assistants. Others will be needed because of the influx of complex automated equipment; Chief of this group is the bio-medical engineering technician, and a recent study estimates there will be employment opportunities for 10,800 BMET's by 1970, at a projected rate of increase that would indicate some 26,000 by 1975 for this category alone.

Suffice it to conclude at this point that estimates have been made by varying groups, covering medical laboratory personnel at many different levels, to project how many will be needed in the coming decade to fulfill a variety of tasks in a variety of settings -- all aimed at the basic goal of providing diagnostic service to find the hidden clues to disease.

What does it all add up to? As stated at the beginning, a "numbers game" for health manpower can be confusing and misleading because of the different bases and assumptions used. The Bureau of Labor Statistics estimates 75,000 medical technologists and 100,000 laboratory assistants, for a total of 175,000 in 1975. The American Hospital Association ends up with a total of 120,600 personnel in diagnostic services, for hospitals alone. And the Bureau of Health Manpower, on the basis of "professional judgment," estimates a need for 70,000 medical technologists for 1975, with no estimates for other categories of laboratory workers. The Manpower Administration report of the Department of Labor estimates 160,000 medical laboratory personnel will be employed in the health service industry, and when an estimated 43,200 projection for those outside the health service industry is added the total of about 203,200 seems to come nearest to predictions of future needs by those closest to the field.

Regardless of the amounts, what is obvious is that more manpower is needed now and will be needed in the future, more hands with better education and better training, capable of fulfilling a variety of vital tasks in a variety of settings, all aimed at the fundamental goal of helping the diagnostic team find the hidden causes and cures of disease.

FEDERAL AID TO EDUCATION FOR MEDICAL LABORATORY PERSONNEL

In recent years, federally supported programs have been initiated to help develop and strengthen education and training programs for medical laboratory personnel. Among these are the following:

PUBLIC HEALTH SERVICE

Cancer Control Program: This program has pioneered in projects supporting education for laboratory personnel, notably cytotechnologists, through grants to AMA-Approved Schools of Cytotechnology for training stipends, as well as grants to the National Committee for Careers in Medical Technology for projects to help cytotechnology schools with recruitment, methodology and education (including production of the "Manual of Cytotechnology" and the education film, "Cytology, Parts I and II"). The Cytotechnology program has grown from 29 schools in 1958 to 98 schools in August 1967. Cancer Control grants also support efforts to strengthen professional laboratory education at all levels, dating back to NCCMT's three-year Alabama Project which led to the establishment of the National Council on Medical Technology Education, also financed by the Cancer Control program.

The Cancer Control Program has given grants to three universities for graduate education leading to master's degrees for medical technologists (University of Alabama, Ohio State University, University of Minnesota) and to eight continuing education programs for medical technologists.

Bureau of Health Manpower: Under the Allied Health Professions Personnel Training Act of 1966, grants for construction, basic and special improvements, advanced traineeships and development of new types of health technologists are authorized for baccalaureate and graduate allied health curricula including medical technology, and for training in junior college associate degree programs. The accredited institution seeking a grant must be affiliated with a teaching hospital and have at least 20 students enrolled in the specified training programs. In fiscal year 1967, about $4,000,000 was appropriated for basic improvement grants (about 200 in medical technology), advanced traineeship grants (8 in medical technology), and new health technology curricula, including two related to medical technology. No construction grants were made. For fiscal year 1968, 28 colleges and universities received advanced traineeship grants for medical technology curricula. Other grants were not announced in time for inclusion here.

The Bureau had a contract with NCCMT for a project to study ways of bringing inactive medical technologists back to work and to develop materials and a curriculum guide for use in retraining them. A third phase of this project is pending under Labor Department support (see next page). In an over-all approach, the Bureau also is supporting an emergency program of refresher courses throughout the country for inactive health personnel, including technologists.

Regional Medical Programs: Under the Heart Disease, Cancer and Stroke Amendments of 1965, grants to some 50 regional medical programs are to include support for continuing education and other specialized training of health personnel.

Comprehensive Health Planning: Under this 1966 legislation, aid is authorized to States and communities for health planning, including plans for manpower, and allows for more flexibility in developing programs, including training of personnel.

OFFICE OF EDUCATION

Division of Vocational and Technical Education: This unit is responsible for the permanent program of aid for vocational and technical education provided under the older Smith-Hughes and George-Barden Acts, and the Vocational Education Act of 1963. These provide grants to State boards of vocational education to support vocational training leading to gainful employment which requires less than a bachelor's degree and is given under public supervision or control or under contract with a State board or local education agency.

The Division also helps administer aid under the MDTA Acts (see description under Department of Labor).

As of August 1967, there were 14 Certified Laboratory Assistant Schools developed under the Vocational Education Acts.

The Division financed a pilot Teacher Education Institute, sponsored in August by NCCMT and NCMTE to help instructors of laboratory assistants learn teaching techniques, learning principles and use of audio-visual equipment.

Through a contract with NCCMT, the Division supported preparation of a comprehensive suggested guide for training laboratory assistants, published last year and now sold through the Government Printing Office.

Office of Higher Education: There are no specific Federal scholarship and loan programs earmarked for medical technologists, as there are for nurses, doctors, dentists and other professions. However, medical technology students are eligible for aid under the National Defense Student Loan and Guaranteed Loan programs, Educational Opportunity Grants, and College Work-Study Program. The teacher forgiveness provision of the National Defense Student Loan program has been declared applicable to graduate students who become full-time teachers in AMA-Accredited Schools of Medical Technology.

DEPARTMENT OF LABOR

Manpower Development and Training Act (MDTA): This program is administered by the Department of Labor in cooperation with state employment agencies, to determine training needs, select, refer, test and place trainees and pay allowances to eligible trainees. The Office of Education is responsible for approving content of MDTA institutional training projects. MDTA reports that from August 1962 through December 1966, a total of 544 "medical laboratory assistants" and 147 "medical technicians" were trained in MDTA projects.

As of August 1967, there were 20 CLA schools developed under MDTA.

Grants have been given under the MDTA and Amendments for experimental and demonstration projects offering new techniques for training disadvantaged individuals. Among these is NCCMT's Laboratory Assistant Field Project; another is a project at Howard University to train aides in health fields, including laboratory aides.

An MDTA grant is pending for the third phase of NCCMT's Back-to-Work project, to recruit and retrain inactive medical technologists using materials developed in the earlier phases of the project (see under Bureau of Health Manpower).

VOCATIONAL REHABILITATION ADMINISTRATION

A VRA grant to NCCMT is helping attract more disabled persons to careers in the medical laboratory. VR counselors in Pennsylvania, New York and New Jersey are cooperating in a demonstration phase of this program, being urged to refer qualified candidates to medical technology, cytotechnology and CLA schools in their areas. VR funds support the students' education.

EDUCATION FOR MEDICAL LABORATORY PERSONNEL

Education for medical laboratory personnel takes place at many different levels ranging from post-high school Certified Laboratory Assistant programs, junior college CLA curricula or prerequisites for cytotechnology, college and university medical technology courses and science majors, and graduate programs for master's and doctorate degrees in the sciences and in education or administration.

In addition, there are continuing and in-service education to keep laboratory personnel informed about new techniques, theories, principles and equipment.

The following projections for population give some indication of the potential sources of students for these various levels of education, as well as of possible effects on increased laboratory workload: 1/

	1965	1966	1967	1975
Population				
U.S. Population	195,195,000			223,800,000
Births per year	3,800,000			5,300,000
Number under 15 years old	60,000,000			65,300,000
Number 65 years or older	18,500,000			21,200,000
18-year-olds	3,729,000			4,112,000
Education				
High School graduates	2,642,000			3,319,000
Freshmen in 4-year college	1,041,000			1,379,000
" " junior college	401,000			611,000
Baccalaureate degrees	492,984			818,000 2/
In biological sciences	25,224			49,870
In physical sciences	17,876			33,330
In health professions (nursing, M.T., etc., excluding M.D., D.D.S., etc.)	11,664			(not available)
In medical technology	2,004			(not available)
Graduates, AMA-Accredited Schools of Medical Technology 3/	3,283	3,460	3,599	5,370 (projecting 5% annual increase of 1965-67)

1/ Sources of figures from U.S. Bureau of Census estimates; "Summary Report on Bachelor's and Higher Degrees Conferred During the Year 1964-65, "Office of Education, 1966; "Projections of Educational Statistics to 1965-1975," Office of Education, 1966; Council on Medical Education, American Medical Association, and Board of Schools of Medical Technology, ASCP

2/ Baccalaureate degrees plus first professional degrees totaled 538,930 in 1965, latter representing about 8½% of total 1975 projections given by Office of Education are given only for total of two categories; figure above is minus an 8½% projection for first professional degrees. Other breakdowns are for baccalaureate degrees only, but none have been made for health professions in this separate category.

3/ From 85-90% of graduates each year either already have baccalaureate degree or receive it after completing MT schools. In addition to those receiving their degree in medical technology, about one-third receive them in biology, chemistry or other science field. 1967 total is incomplete; reports from 32 schools not received.

College Affiliation

According to nearly complete tabulations of 1966-67 reports from AMA-Accredited Schools of Medical Technology, about 630 of the 758 schools actually operating in the last academic school year had affiliations with at least one college or university, which granted a baccalaureate degree to students successfully completing the fourth year at the Medical Technology School. About 65 programs are in university medical schools or medical centers.

A new classification by the Board of Schools is an "integrated" college or university program, denoting a medical technology curriculum that is incorporated as an integral part of a college or university program and is recognized as such by the Board of Schools. For 1966-67, the Board of Schools recognized 16 integrated programs.

Graduate Study for Medical Technologists

A growing number of medical technologists are undertaking advanced education programs, particularly those offering Master's Degrees -- and an increasing number of such graduate programs have developed in recent years, many with financial stipends provided through Public Health Service grants. This graduate education provides a wider breadth of knowledge, opportunities for basic research, advancement to positions of greater responsibility and in some cases in areas of education or administration, as well as measurable advantages in income.

Graduate degree programs in the sciences are offered at many accredited colleges and universities, and MT(ASCP)s with a baccalaureate degree may apply for admission to them. Teaching supervisors might wish to concentrate in education, studying methodology, tests and measurement, curriculum development and other courses to help them as medical technology educators. Those planning to concentrate in laboratory supervision or administration might secure advanced degrees in personnel management, hospital or health care administration.

Some institutions have received advanced traineeship grants from the Public Health Service under the Allied Health Professions Personnel Training Act of 1966, for programs preparing medical technologists to be specialists, teachers or supervisors. These are not necessarily degree-granting programs, although most do offer a master's in medical technology, pathology or in a specific science area (e.g., microbiology, biochemistry, etc.). Other institutions not included in this listing may offer general graduate programs in science, education or administration, for which MT(ASCP)s with baccalaureate degrees may become candidates.

Details on graduate education for medical technologists are available from NCCMT pages. Results of a 1965 study by Harriet M. Boyd, M.S., M.P.H.,MT(ASCP), University of Pennsylvania School of Medical Technology, who tallied responses by MT(ASCP) registrants in their 1966 renewal forms on graduate study, indicated that 779 had master's degrees, including 235 in microbiology, 105 in biochemistry or chemistry, 96 in medical technology, 78 in biology, 43 in education, 34 in public health, 26 in clinical pathology. In addition, there were 66 persons with Ph.D. degrees, and 53 other doctorates (including 35 M.D.s and 5 medical students). There were also 92 candidates for Master's degrees and 11 Ph.D. candidates. This was out of 28,646 renewals processed at the time.

A. LAWS OR REGULATIONS COVERING MEDICAL LABORATORIES

State	Labs Covered		Licensure or Registration of Labs Required	M.D. Supervision Required	Personnel Governed by Law or Regulation (see pp. 2-6)			
	Private	Hospital			Director	Supervisor	Technician/ Technologist	Trainee
Alabama	X						X(1)	
California	X	X	yes		X		X	X
Connecticut	X		yes		X			
Delaware	X		yes(2)	X	X			
District of Columbia	X	X		X(3)				
Florida	X	X	yes		X	X	X	X
Hawaii	X		(4)		X		X	
Illinois	X	X	yes		X	X	X	X
Louisiana	X			X(3)				
Maryland	X	X	yes		X		X	
Massachusetts	X			X(5)				
Nevada	X	X	yes		X		X	
New Hampshire	X	X		X				
New Jersey	X		yes		X			
New York	X	X	yes		X			
New York City	X	X	yes		X	X	X	X
Oregon	X	X	yes(6)					
Pennsylvania	X		yes		X	X	X	X
Rhode Island	X		yes		X			
Tennessee	X	X	yes		X	X	X	X
Texas	X	X		X(3)				
Puerto Rico	X	X	yes		X		X(7)	

(1) Alabama has a voluntary certification program for technologists, but does not regulate laboratories.

(2) Delaware State Board of Health has "official regulations governing the establishment and operation of medical or clinical laboratories" which involves approval, not licensure.

(3) Laboratory operation in the District of Columbia, Louisiana, and Texas is considered practice of medicine.

(4) Hawaii requires licensure of all laboratory personnel, but not laboratories themselves.

(5) Massachusetts has a limited voluntary laboratory approval program; in practice, certification applications are required to be signed by a licensed physician.

(6) Oregon requires annual registration of laboratories, but does not license them.

(7) Puerto Rico has a separate law requiring licensure of technicians as well as a law requiring licensure of laboratories.

B. REQUIREMENTS FOR CLINICAL LABORATORY DIRECTOR AS ESTABLISHED BY LAW AND/OR REGULATION

State	Actual Licensure Required	Educational Degree In Appropriate Science(s)	Professional Recognition	Practical Experience	Examination
California	1. licensed M.D. 2. yes -(bio-analyst)	1. M.D. degree 2. Masters degree	1. licensed in California	1. none 2. 5 years (4 yrs. till '68)	1. no 2. yes
Connecticut	no	1. M.D. - Pathologist 2. MD, DDS, or DVM 3. DS or PhD 4. "unusual background, proven ability"	1. Certified by Amer. Board of Pathology		
Delaware	no	1. M.D.			
Florida*	yes	To be established in regulations			
Hawaii	yes	1. none 2. MS 3. DVM 4. MD or PhD		1. 5 years 2. 3 years 3. 1 year 4. none	optional " " "
Illinois	no	1. M.D. - Pathologist 2. MD or DDS 3. MA or MS	1. Certified by Amer. Board of Pathology		1. no 2. no 3. opt.
Maryland	no	1. MD or DS		1. 2 years	
Nevada*	no	To be established in regulations			
New Jersey	yes	1. MD 2. PhD 3. MA or MS 4. BA or BS		1. none 2. 1 year 3. 2 years 4 3 years	
New York	yes	1. MD, DS, or PhD 2. MD with "special training in pathology" 3. MD, DDS, or DVM 4. DS or PhD	1. Certification by specialty board	1. none 2. none 3. 4 years 4. 4 years	

* Recently passed law.

B. cont. REQUIREMENTS FOR CLINICAL LABORATORY DIRECTOR AS ESTABLISHED BY LAW AND/OR REGULATION

State	Actual Licensure Required	Educational Degree in Appropriate Science(s)	Professional Recognition	Practical Experience	Examination
New York City	yes	1. M.D. - Pathologist 2. MD, DDS, or DVM 3. DS, PhD	1. Certification by Amer. Board of Pathology 2. Either Board certification in a laboratory specialty or 3. Either Board certification in a laboratory specialty or	4 years 4 years	
Pennsylvania	no	1. M.D. - Pathologist 2. MD, DDS, or DVM 3. DS or PhD 4. MS 5. BS	1. Certification by Amer. Board of Pathology	1. none 2. 2 years 3. 2 years 4. 4 years 5. 5 years	1. yes** 2. yes** 3. yes** 4. yes** 5. yes**
Rhode Island	yes	1. PhD or MD 2. MS 3. BS 4. none		1. 2 years 2. 4 years 3. 5 years 4. 10 years	
Tennessee*	yes	To be established in regulations			
Puerto Rico	yes	1. MD, with training in pathology 2. BA/BS, and 1 year training in technologist school 3. MS or PhD 4. Chemist	4. Licensure by Commonwealth	1. none 2. 5 years 3. none 4. none	

* Recently passed law.
** Exception may be made in case of an individual with unusual background and personality.

C. REQUIREMENTS FOR CLINICAL LABORATORY SUPERVISOR AS ESTABLISHED BY LAW AND/OR REGULATION

State	Actual Licensure Required	Educational Degree in Appropriate Science(s)	Practical Experience	Examination
Florida*	yes	To be established in regulations		
Illinois (supervising technologist)	no	1. 2 years of college with 1 year of laboratory training	1. 2 years	
New York City	yes	1. MD, DS, or PhD	1. 2 years in a specialty in acceptable laboratory**	
		2. MA or MS	2. 4 years, including 2 in acceptable laboratory**	
		3. Registration with a national board of registry in a specialty	3. 6 years	
		4. BA or BS	4. 6 years, with proficiency in a specialty	
Pennsylvania	no	1. DS, MD, DDS, DVM, or PhD (i.e., a doctoral degree)	1. 2 years	1. yes
		2. MS	2. 4 years	2. yes
		3. BS	3. 5 years	3. yes
Tennessee*	yes	To be established in regulations		

* Recently passed law.

** Such training must be in the "laboratory of a hospital, health department, university, research institution or other laboratory acceptable to the N.Y.C. Health Department," as specified by law.

D. REQUIREMENTS FOR TECHNOLOGIST AND TECHNICIAN AS ESTABLISHED BY LAW AND/OR REGULATION

State	Actual Licensure Required	Educational or Professional Certification	Practical Experience	Examination
California (technologist)	yes	1. BA or BS in clinical laboratory technique 2. BA or BS in science 3. 3 years of college, 1 year training and ASCP certification as medical technologist	1. 6 months (optional) 2. 1 year 3. 1 year	1. yes 2. yes 3. yes
Florida* (technologist) (technician)	yes yes	To be established in regulations		
Hawaii (technician)	yes	1. BA or BS in science 2. Eligibility for ASCP certification as medical technologist		1. opt. 2. no
Illinois (technician)	no	1. "must have adequate training"		
Maryland (technologist)	no	1. BA or BS in a science 2. Registration by ASCP as Medical Technologist	1. 1 year 2. none	
New York City (technologist)	yes	1. BA or BS in a science 2. Registration in a laboratory specialty by a national board of registry	1. 1 year as technician or trainee 2. none	1. no 2. no
		* * * * * * * * * * * * *	* * * * *	* * *
(technician)	yes	1. 60 semester hours of college in certain required courses 2. High School graduation 3. High School graduation	1. 2 years as trainee 2. 2 years as trainee 3. none	1. no 2. no 3. yes

* Recently passed law

D. cont. REQUIREMENTS FOR TECHNOLOGIST AND TECHNICIAN AS ESTABLISHED BY LAW AND/OR REGULATION

State	Actual Licensure Required	Educational or Professional Certification	Practical Experience	Examination
Nevada* (technologist) (technician)	 no no	To be established in regulations		
Pennsylvania (technologist)	no	1. BA or BS with certain required courses	1. 1 year	1. yes
		* * * * * * * * * * * * *	* * * * *	* * *
(technician)	no	1. 2 years of college	1. 1 year of training	1. yes
		2. High School graduation	2. 1 year of training and 2 years experience	2. yes
Tennessee* (technologist) (technician)	 yes yes	To be established in regulations		
Puerto Rico (technician)	yes	1. 2 years of college	1. 1 year of training	1. yes
		2. Registration by ASCP as medical technologist	2. none	2. no

* Recently passed law.

CERTIFICATION FOR MEDICAL LABORATORY PERSONNEL

Medical Technologists and Cytotechnologists: Requirements for certification by the Board of Registry of Medical Technologists of the American Society of Clinical Pathologists are outlined in detail in the Registry booklet, which follows this page. Also included are descriptions of certification for specialist categories and limited certification for histologic technician.

Certified Laboratory Assistant: The Board of Certified Laboratory Assistants of the American Society of Clinical Pathologists, which includes four members from ASCP and four from the American Society of Medical Technologists, gives an annual examination each October for graduates of approved CLA schools and other individuals who may be eligible. Persons passing this examination are certified as CLAs. In addition, persons may be certified as CLA by reciprocity, because of training on specific levels in the military or in programs previously approved by ASCP and ASMT.

Clinical Chemists: The American Board of Clinical Chemistry, founded in 1950, under sponsorship of the American Chemical Society, American Institute of Chemists, and American Society of Biological Chemists (joined in 1954 by the American Association of Clinical Chemists), certifies as qualified specialists persons in clinical chemistry or toxicological chemistry, with an earned doctorate degree in the natural sciences or in medicine with adequate training in biochemistry and other chemical disciplines at the graduate level, plus at least three years subsequent full-time experience in clinical chemistry, in laboratories maintaining a standard in clinical chemistry acceptable to the Board. Applicants passing an examination are certified as diplomates of this Board. About 300 diplomates have been certified since 1952.

National Registry in Clinical Chemistry: This new group is sponsored by all groups listed in the above paragraph, and is presently developing accreditation programs for persons in clinical chemistry or clinical chemistry technology not eligible for Board certification. Final plans were developed in August, but tentative plans were to certify as Clinical Chemists persons with B.S. degree and 32 semester hours in chemistry, and five years in a clinical laboratory; to certify as Clinical Chemistry Technologists persons with B.S. degree but not necessarily all the required chemistry courses or the full five years of experience. The executive secretary of ACS is serving as executive director of the new Registry.

Microbiologists: American Board of Microbiology certifies individuals with an acceptable Doctor's degree and at least five years of relevant experience. The area of certification is designated as Public Health and Medical Laboratory Microbiology, covering diagnostic and clinical microbiology at the urban, state and federal levels; research in experimental infectious and immunological diseases, and the teaching of medical students, medical technologists and others being trained to know these fields. The Board is a Committee of the American Academy of Microbiology. There are nearly 500 doctorates.

National Registry of Microbiologists: Set up by American Board of Microbiology to recognize competence at the bachelor's level for persons with a major in a biological science (30 semester hours, of which at least 20 must be in the field of microbiology), plus two years of chemistry, one year of physics and mathematics through college algebra. Acceptable applicants take an examination in general microbiology and a comprehensive examination in two out of seven fields of specialization. Those who pass are entered as Registered Microbiologists of the National Registry. No practical experience is required. There are about 700 Registered Microbiologists (one-half of whom have M.S. or Doctor's degree).

The American Board of Microbiology is presently formulating a program of recognition at the intermediate level. Although known as an M.S. program, it will provide for qualification without that degree, and will include an experience qualification, probably four or six years. Individuals so qualified possibly will be known as Specialist.

PUBLICATIONS

(Pamphlets, reprints and other publications included, excerpted or summarized in Resource Books)
- Listed in order of appearance -

"Automation in Clinical Laboratories" - Proceedings of a Workshop Conference: Thomas D. Kinney, M.D., and Robert S. Melville, Ph.D. Obtainable from Robert S. Melville, Ph.D., Research Grants Branch, National Institute of General Medical Sciences, Westwood Building, Bethesda, Maryland 20014.

"The National Laboratory Crisis" by Henry Bauer and "The Laboratory Crisis: A State Shows It Can Be Overcome" by Howard L. Bodily, Ph.D. Reprinted from Hospital Practice February-March 1967

"Medicine, Money and Manpower - The Challenge to Professional Education" by Ward Darley, M.D. and Anne R. Somers. Five-part article from New England Journal of Medicine, June 1-29, 1967

"Training Health Service Workers: The Critical Challenge" - Proceedings of the Department of Labor-Department of Health, Education and Welfare Conference on Job Development and Training for Workers in Health Services held February 14-17, 1966

A Fact Sheet - Careers in the Medical Laboratory.Obtainable from the Registry of Medical Technologists, Box 2544, Muncie, Indiana 47302

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